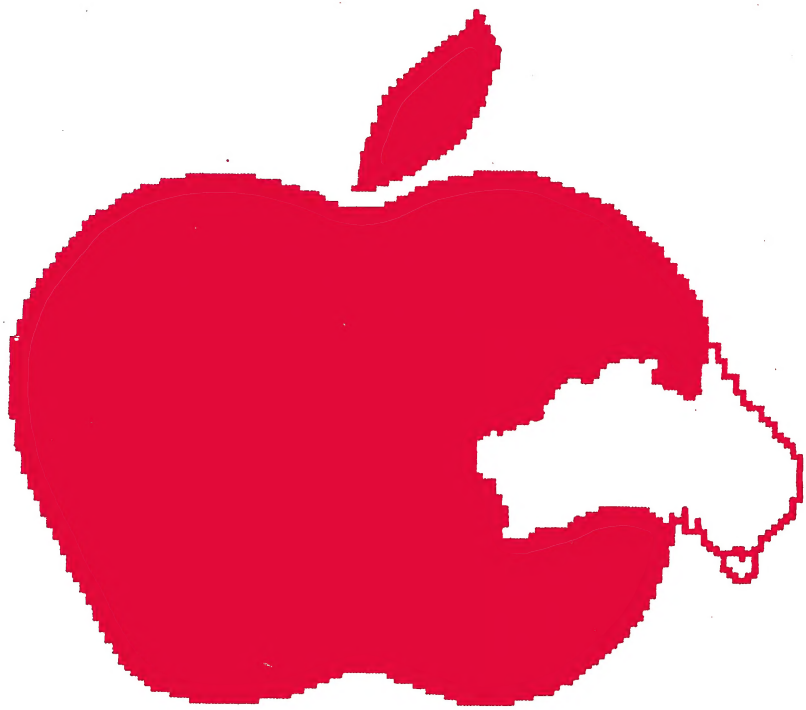
APPLECATIONS



apple users group

SYDNEY AUSTRALIA

CLUB MEETINGS : 6.30 p.m.- 2nd. MONDAY of each month at the SYDNEY GRAMMAR SCHOOL, SCIENCE AUDITORIUM.

MEMBERSHIP : $15 Joining Fee, $20 Subscription.

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March * 1983

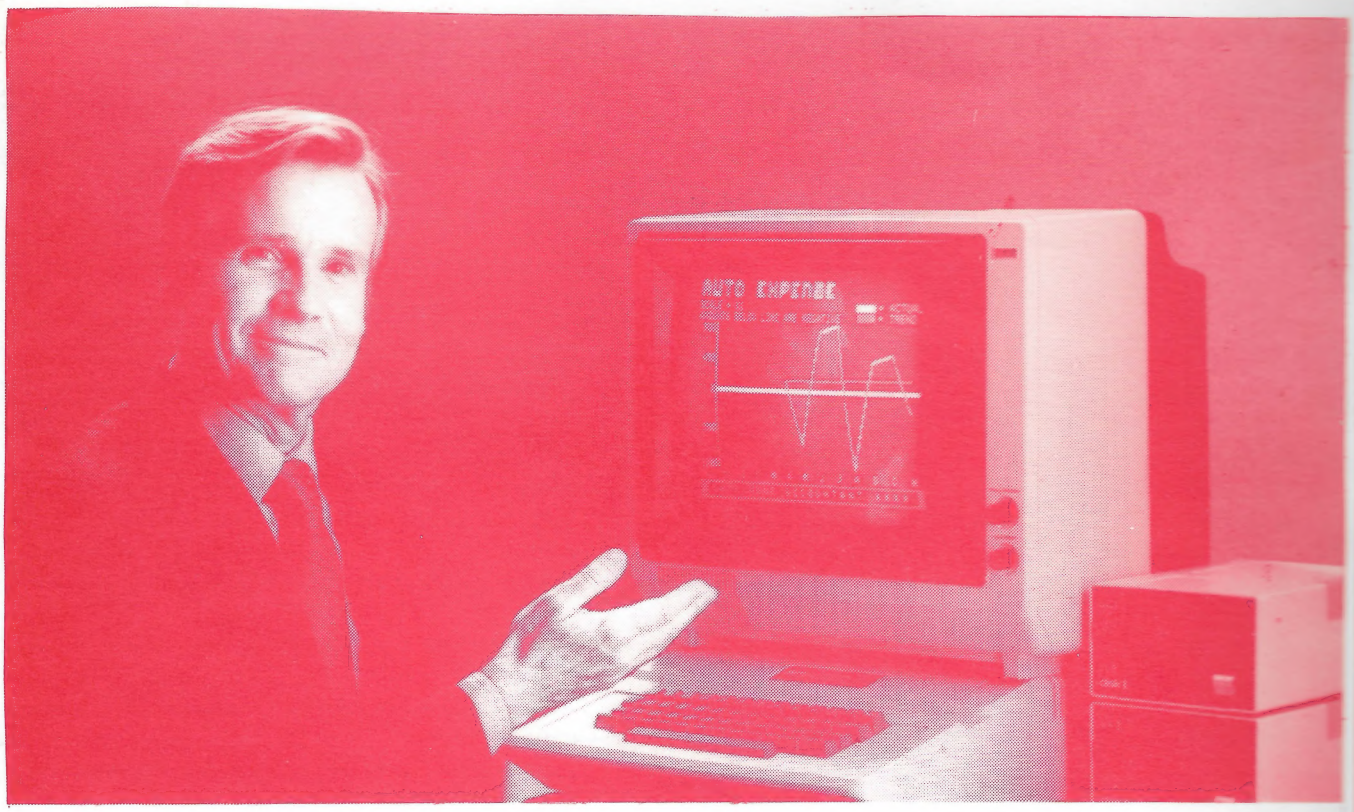
HIGHLIGHTS

MICROCOMPUTERS
'The Second Wave'

Apple Trouble Shooting

****
* Australian *
* Personal *
* Computing *
* SHOW *
****

REGISTERED BY AUSTRALIA POST - PUBLICATION No. NBH 3716



CONTINENTAL'S HOME ACCOUNTANT IS NUMBER ONE— AND CLIMBING.

For the past several months, Softalk magazine has rated Continental Software's Home Accountant™ No. 1 in its "Home 10" best-seller list.

A lot of programs would have "peaked" by now. But with over 10,000 copies in use, Home Accountant just keeps getting stronger.

There's a reason for this spectacular success—and it's not just the low suggested price of $94.95.

The fact is, Home Accountant is one of those rare programs that virtually everybody can profit from using. It's powerful enough to handle even the most complicated family budget—yet it's so easy to use that one quick trip through the manual may be all you'll ever need.

With Home Accountant you can track up to 100 budget categories, 5 different checking accounts, and all the credit cards you can carry. Just press a few keys and watch the program print your checks, net worth and other financial statements. And when you see the full-color graphs of actual vs. budgeted expenses, trend line analyses, etc., you'll know you bought the best.

See your Apple dealer soon for a demonstration. And start watching your fortunes climb with Home Accountant.

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* C O N T E N T S * MARCH 1983 *

* APPLECATIONS is EDITED *
* using SANDY'S WORD PROCESSOR *
* *
* with 'VISION — 80' card *

FEBRUARY MEETING NOTES.

By Colin Rutherford, Honorary Secretary.

Our meeting got off to a belated start this month but at least many members managed to make their purchase from Don Riley early in the evening while we waited.

Genial Ed Mehrtens took the chair as President Bruce Kehlett had advised that he could not attend. All other committee members were present.

Australian Personal Computer Show information was now available; It is to be held on March 10th. to 12th. at CENTERPOINT Sydney. The organisers have offered AUG members half price concession tickets, which will hopefully be enclosed with the magazine. Ron Lombardo will arrange for manning of our stand (provided free by courtesy of Australian Personal Computing). It was moved and carried, that the Treasurer should investigate and at his discretion arrange to sell T-shirts and/or iron-on Logos advertising the AUG.

We hope to meet many members who cannot attend our meetings, at the show.

Peter Kazacos reported a current bank balance of $9147.60. A delay in the auditing of the 1982 balance sheet prompted us to take some action by moving that the Treasurer pay to have the auditing done as soon as possible by a professional accountant. The motion was carried.

The Librarian had prepared disk #31 for this month. Library boxes are no longer available with blank disks but good quality disk storage files holding forty and ninety disks were displayed. They will be on sale at meetings or may be mail ordered from the librarian.

New offerings from Ed Mehrtens, including two books, programs and joysticks will be advertised in 'Applecations' for members to purchase. A Taiwanese Disk drive called Applemate was shown. Bill Hood will be supplying these through the normal Bulk Purchase ordering system. He has been using two extensively and found them to perform exactly the same as Apple drives. Prices appear in the order form.

The Editor/Membership Recorder, Hans Hoffman reminded members that renewals must be made before the end of February. Evidence of membership is your membership card which shows the expiry date.

In general business a series of motions were presented, relating to encouraging contributions to club activities by means of awards of cash, goods or trophies. After discussion the matter was treated as a single motion as follows.

Moved by C. Orton and seconded by H. Hoffman; That the AUG shall provide a substantial award each year for:

(a) The best article which appeared in Applecations and was written by an AUG member.

(b) The best program which appeared on a club disk and was written by an AUG member.

(c) The AUG member who not holding any office within the AUG contributed most to the club.

Awards made by the AUG shall be decided by a written vote of the members. Awards made by the AUG may be funded from any source considered appropriate by the committee.This motion shall be included in the by-laws. Carried.

The usual discussion session followed.

-Graham Clark suggested that members should awake the computer community to the significance of the AUG and in particular to seek favourable treatment and concessions on presentation of the membership card.

-Ken Ozanne again offered to help beginner Apple owners by answering questions sent in writing through a column in the magazine.

-'Blade of Blackpool' is reported to be a difficult adventure game.

-An offer of membership in the Australian Beginning for $25 might now be out of date but phone 888-7151 if you are keen.

Norman Cincotta from the AMP Insurance Company presented some information on comprehensive cover at all levels for computer owners. Not surprisingly he had to field some critical questions on the insurance business, but was willing to help members with any computer insurance requirements that they might have.

The meeting closed at about 8.00 p.m.

BUY—SELL—TRADE

MICROSOFT Z80 card c/w CP/M and Microsoft MBASIC/GBASIC. $350 o.n.o. - URGENT SALE

Also 2 books by R.Zaks:
'Programming the Z80' $12
'6502 Games' 10 games in machine language $10
contact S.Marshall 234-7064 bus., 44-4665 a.h.

CORRESPONDENT WANTED
Apple owner/Amateur radio operator in ITALY would like to exchange disks with Australians. Special interest in voice synthesising - has published articles.
Reply to Prof. Franco FANTI
Via Alberto Dallio n19
40139 BOLOGNA, ITALY

DOS AND ASSEMBLER COURSES

by Ken Ozanne

It is time to enrol. Numbers in both classes are limited. You have to pay your fees before your place is secured.

March DOS COURSE
---------- Starting Wednesday March 16th (NOT 17th as I had it last issue) at 6p.m., and running for 8 weeks at two hours per week in room 1518 of the Institute tower building, 15-73 Broadway, a block from Railway Square. You may need to get a lift to the 16th floor and walk down one flight.

It will be very similar to the course last year except for whatever I have learned in the meantime (a fair bit). Cost $65, which includes the notes and disk for which I charged extra last time.

For those who haven't heard about it, that means an in depth study of the Apple DOS, covering considerably more than is in the DOS Manual and Beneath Apple DOS. It is not intended for the absolute beginner but for people wanting to increase their depth of undertanding. You should reckon on setting aside time for exercises to get the most out of the course. It is highly desirable to read both the books mentioned beforehand.

Checks should be made payable to INSEARCH Ltd. (not me) and can be mailed either to INSEARCH or to me. (Same P.O. Box.) It is time to get your money in if you want to be in the course - I had to turn away quite a few people last time.

May APPLE ASSEMBLY LANGUAGE
---------- This is a course in 6502 assembler done properly (well, as I think it should be done). I intend to cover not only writing assembler/machine language programs for the 6502 but how to make effective use of them on the Apple. This means using the 20-30 K of machine code that we all have in residence as well as our own code. It also means interfacing machine code with the ROM language (mostly Applesoft) via &, USER and CALL.

I have decided to allow use of whatever assembler you have (the mini assembler is NOT adequate). Please let me know what you have when you enrol. If anyone is lacking an assembler, I can arrange to get you one but will need TIME to do so - contact me immediately if you need this service. (I should be able to get either BIG MAC or the SC ASSEMBLER - two of the best.)

Cost of the course will be $65 for a course of 8 x 2 hour lectures, plus notes and software. No promises at this stage as to the extent of the notes, but I am planning a book on 6502 assembler and you will probably get a draft of that, or perhaps just part of it.

If you intend to attend this course, please let me know (in writing) what assembler you have as soon as possible. I may have to plead ignorance on some. If you have a choice, then my choice is BIG MAC.LC.

Again, you will get much more out of the course if you have read a book on 6502 assembler beforehand. Leventhal's book is by far the most comprehensive, but also the most forbidding. (And it does not refer to the Apple at all.) Wagner's book or Hyde's are much easier going but don't get nearly as far.
Mottola's and Inman's books are easier still and don't get very far at all (if you read one of these you should get one of the others as well). Finally, De Jong's book is aimed more on the hardware side than the others and is medium to hard reading. I won't read anything by Rodnay Zaks and don't rate his books. His writing is too slipshod for my taste.

The assembly language/machine language course starts either 11th or 18th May, depending whether I decide to take a week off between courses. (Assume the 18th.) It is also in room 1518 on Wednesday nights from 6 to 8 p.m.

Still less than the DOS course is this one intended for beginners to the Apple. I will assume no previous knowledge of machine language, but I will assume general knowledge of the Apple and Applesoft programming.

Officialy, these courses rank as courses offered by me personally, through INSEARCH ltd., the Institute Research and Development company. This means that they will not count for Institute credit (I don't think any extension courses do, though there are some which may be counted towards admission requirements).

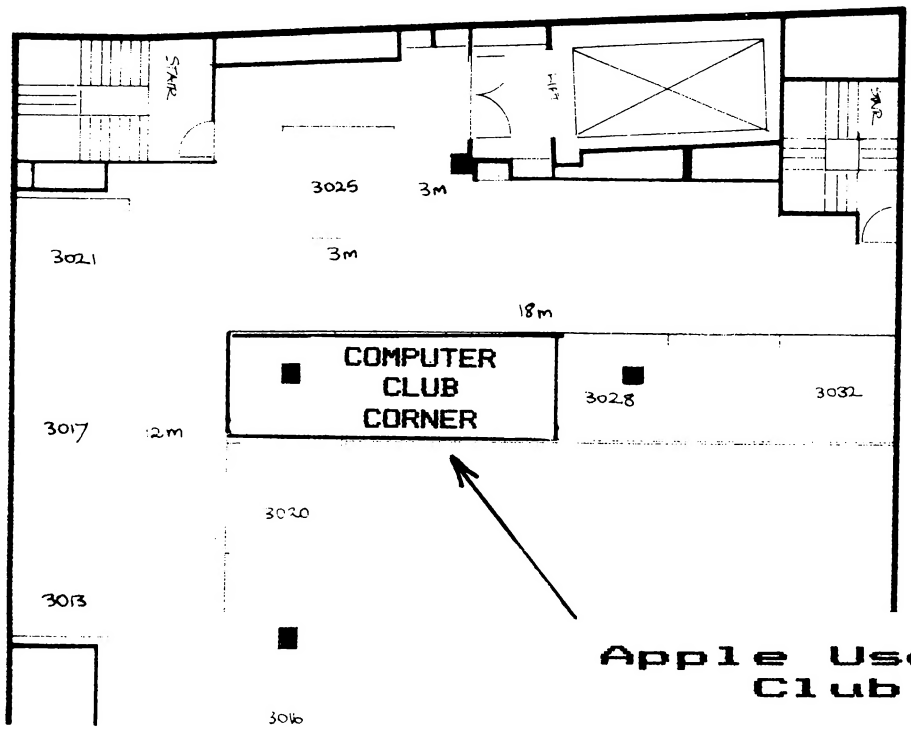
It also means that some of the Institute bureaucracy is bypassed - courses are approved at a faculty (school) level rather than by the Institute as a whole. If you have any qualms about the course content, I'd suggest talking to those who have attended my DOS class.
My address is:

K.W. Ozanne
Senior Lecturer
School of Mathematical Sciences
The New South Wales Institute of Technology
P.O. Box 123
Broadway, NSW 2007

phone 218-9954 (but I am extremely hard to get) - it is almost always better to write, giving me a number and time to reach you if it is urgent.

The 1st Australian
Personal Computer Show
Centrepoint Sydney
10-12 March 1983

EXECUTIVE LEVEL



Apple User's Club

SHOW HOURS

THUR 10: 9 AM- 7 PM
FRI 11: 9 AM- 7 PM
SAT 12: 9 AM- 5 PM

Come and see us at the computer club stand. Especially welcome will be those members who cannot normally come to our meetings, particularly country members.

news release

Issued for Apple Computer, Inc. and Electronic Concepts Pty. Ltd.

APPLE PRESS RELEASE

----------by Ron Lombardo

On the 20th of January, a press conference was held in the Masonic Centre, Sydney, as part of a world-wide simultaneous launch of a number of new APPLE products. These products were, new APPLE disk drives and printers, Apple-Net networking system, a 3270 emulation card for APPLE computers, and, most importantly, the APPLE IIe, and the new APPLE LISA.

These products were announced by David Strong, Managing Director of APPLE AUSTRALIA, and Rudi Hoess of Electronic Concepts.

3270 EMULATION

NetComm announced a card which, when combined with an Apple II 80-column display, will emulate an IBM 3270 terminal, using BSC-3 (Binary Synchronous) line discipline, allowing Apple II to link to IBM mainframes for synchronous interactive processing using EBCDIC or ASCII codes up to 9600 bps. As well the card may also be configured to IBM 2780 (Remote Job Entry) standards. Enquiries may be made to NetComm 7/275 Alfred St., North Sydney.

APPLE PRINTERS

New dot matrix and letter quality printers are now available from Apple Computer. The dot matrix is a fast, high-contrast printer for graphics and correspondence-quality applications. Bi-directional speed is 120 cps. The letter quality printer is a daisywheel printer with graphics capability. The speed of the letter quality printer is 40 cps.

NEW APPLE DRIVES

Two new Disk Drive Systems have been announced for APPLE /// (and above) systems. These are "Unifile" and "Duofile", with, respectively, one or two 871,424 Byte 5.25 in. floppy drives. Apple seem to have done a little more than just cram more tracks and sectors onto the available surface area. They seem to have completely re-designed the 5.25 floppy. The mechanism positions read/write heads on opposite ends of the diskette, reducing media wear and increasing data integrity. The system also uses eight electronically controlled motor speeds that vary from track to track, maximising data capacity. Transfer rate for the new drives is 62K bytes per second, four time faster than conventional floppies. Floppies for the new system are already being produced by companies such as Verbatim and 3M. There is no official indication that the new drives will be made available for the II but there is considerable speculation, particularly in the light of the other new developments in the Apple II world.

APPLENET

AppleNet is a local area network designed to allow companies to electronically link their Apple Computers to exchange information and share centrally-located files. All types of Apple computers can be connected to AppleNet for under $600 per connection. AppleNet uses the

Xerox Ethernet Network Systems (XNS) Protocols.
Applenet will be available late in 1983 in Australia.

APPLE IIe

The Apple IIe (for enhanced) is an upgraded version of the Apple II computer. The IIe includes 64K RAM (expandable to 128K), upper and lower case characters, and an expanded keyboard. A new low-cost 80-column card is being made available for the IIe. The main logic board of the Apple IIe now contains about one quarter the IC's that the II contained. Two new LSI chips replace approximately 80 separate circuits on previous Apples.

The Apple IIe retains the 6502 microprocessor, graphics, colour and eight expansion slots (although one is set aside for the new 80 column cards). PAL colour circuitry is built-in on Australian IIe's.

The IIe will immediately replace the Apple II+, although current users will still be supported with service and parts.

Suggested retail price for the Apple IIe is $1,625. As well, a "starter system", comprising an Apple IIe, Disk with controller, 12" monitor with stand, and an Apple 80-column card. Suggested price for this system will be under $2,500.

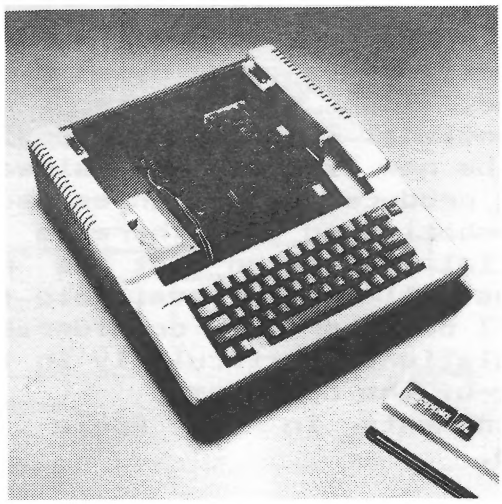
LISA

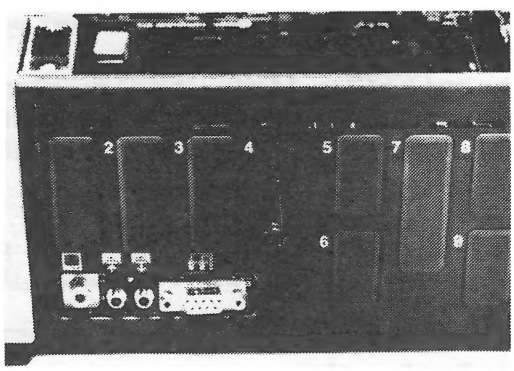
The "APPLE IV" has arrived in the form of a revolutionary new machine called LISA (Local Integrated Software Architecture (?)). LISA is a MC68000 (32-bit) based system which incorporates 1 megabyte of internal RAM, 2x870K floppy drives, 1x5 MByte hard disk, and a very high-resolution black and white monitor.

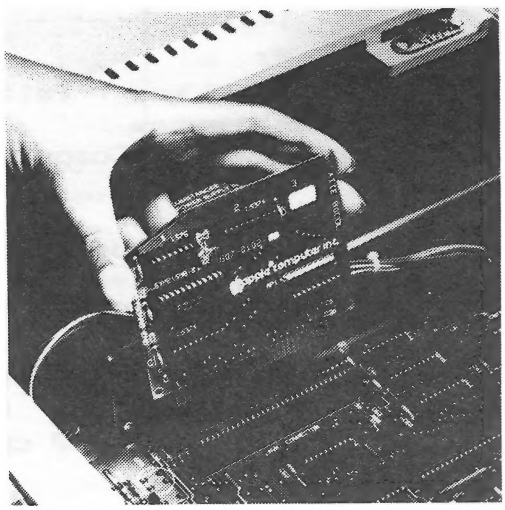
Incorporated within the package is a full selection of integrated software, including business graphics, word processing, spreadsheet analysis, project management, and personal filing.

For a full description of LISA see the article on LISA in the April issue.

Suggested retail price for this complete system is $11,950 and will be available in Australia second quarter 1983.







APPLE IIe technical specifications.

Technical Specifications

■ *Video Display Specifications:*
Through software selection, an Apple *IIe* displays text, high-resolution graphics, and—when connected to a color monitor (or television using an RF Modulator)—color graphics. Graphics commands allow either of two screen "pages" to be displayed, with or without four lines of text below the display area.

Display Modes:
—40-column text, 5x7 dot matrix (TV or Monitor)
—80-column text with optional card, 5x7 dot matrix (Monitor required)
—Low-resolution color graphics (TV or NTSC color monitor)
—High-resolution color graphics (TV or NTSC color monitor)

Text Capacity:
—24 lines by 40 columns
—24 lines by 80 columns with optional 80-column-text card

Character Set:
—96 printable ASCII characters (upper and lower case)

Display Formats:
—Normal, Inverse, Flashing

Low-resolution Graphics:
—16 colors, 40hx48v resolution (or 40hx40v with four lines of text)

High-resolution Graphics:
—6 colors: black, white, violet, green, blue, orange, 280hx192v resolution (or 280hx160v with four lines of text)

■ *Central Processing Unit (CPU) Specifications:*
The Apple IIe's microprocessor is an eight-bit microprocessor with a sixteen-bit address bus.

In the Apple *IIe*, the 6502A runs at 1MHz and performs up to 500,000 eight-bit operations per second.

Type:
6502A

Registers:
Accumulator (A)
Index Registers (X,Y)
Stack Pointer (S)
Processor Status (P)

Register Size:
Eight bits

Data Bus:
Eight bits

Address Bus:
Sixteen bits

Address Range:
65,536 (64K)

■ *Memory Specifications:*
The Apple IIe comes with 64K bytes of dynamic RAM for user memory.

The Apple *IIe*'s programmable storage (64K RAM), read-only storage (16K ROM), and input and output devices are allocated locations in this 64K address space. All input and output in the Apple *IIe* is memory mapped.

User Memory (RAM):
64K dynamic RAM

ROM Memory (ROM):
16K ROM (Programs are permanently stored in two 8K by 8-bit read-only memory chips)
Programs in ROM:
Applesoft interpreter
System monitor routine
80-column display firmware
Self-test routines

■ *System Monitor:*
—disassembler
—automatic input/output device assignment
—keyboard and screen editing features
—register examine/modify and cassette read/write routines
—hexadecimal add/subtract for relative branch calculations

■ *Inputs And Outputs:*
—typewriter-style, full ASCII keyboard
—speaker output
—cassette input and output
—video display output (B/W text & graphics, color graphics)
—seven expansion slots (fully buffered, with interrupt and DMA priority structure)
—hand control input and output (game I/O) signals:
- annunciator outputs (4)
- strobe output (1)
- switch inputs (3)
- analog (hand control) inputs (4)
- ground and +5 volts

—RF modulator output
—numeric keypad input

■ *Electrical Specifications:*
The Apple *IIe*'s power cord should be plugged into a three-wire 110- to 120-volt outlet. The System operates on normal household AC power.

Line Voltage:
107V to 132V AC

Typical Power Consumption:
11 Watts (volt-amperes)

Maximum Power Consumption:
60W continuous
80W maximum

Supply Voltages:
+5V ±3%
+11.8V ±6%
-5.2V ±10%
-12V ±10%

Maximum Supply Currents:
+5V: 2.5A
+12V: 1.5A continuous
2.5A intermittent*
-5V: 250mA
-12V: 250mA

*20 minutes on; 10 minutes off.

Maximum Temperature on Power Supply Case:
55°C (130°F)

■ *Environmental Specifications:*
External Ambient Operating Temperature:
0° to 45°C (32° to 113°F)

Relative Humidity:
5% to 85%

■ *Physical Specifications:*
Apple *IIe*:
height 4.5 inches (11.43 cm)
width 15.13 inches (38.43 cm)
length 18 inches (45.72 cm)
weight 12 lbs (5.45 kg)

Safety and RFI Qualifications:
The Apple *IIe* meets the following agency regulations for Safety and EMC:
FCC Part 15, Class B Computing Devices
CSA 22.2, No. 154-1979
UL 126Z—Office Machines

The Apple *IIe* Personal Computer System Package

64K System
Power Cord
Monitor Cable
Nut Plate Kit
Owner's Manual
Keyboard Tutorial Disk
Warranty and Service Information

U.S. Order No. A2S2064
64K byte Apple *IIe*

Standard Features

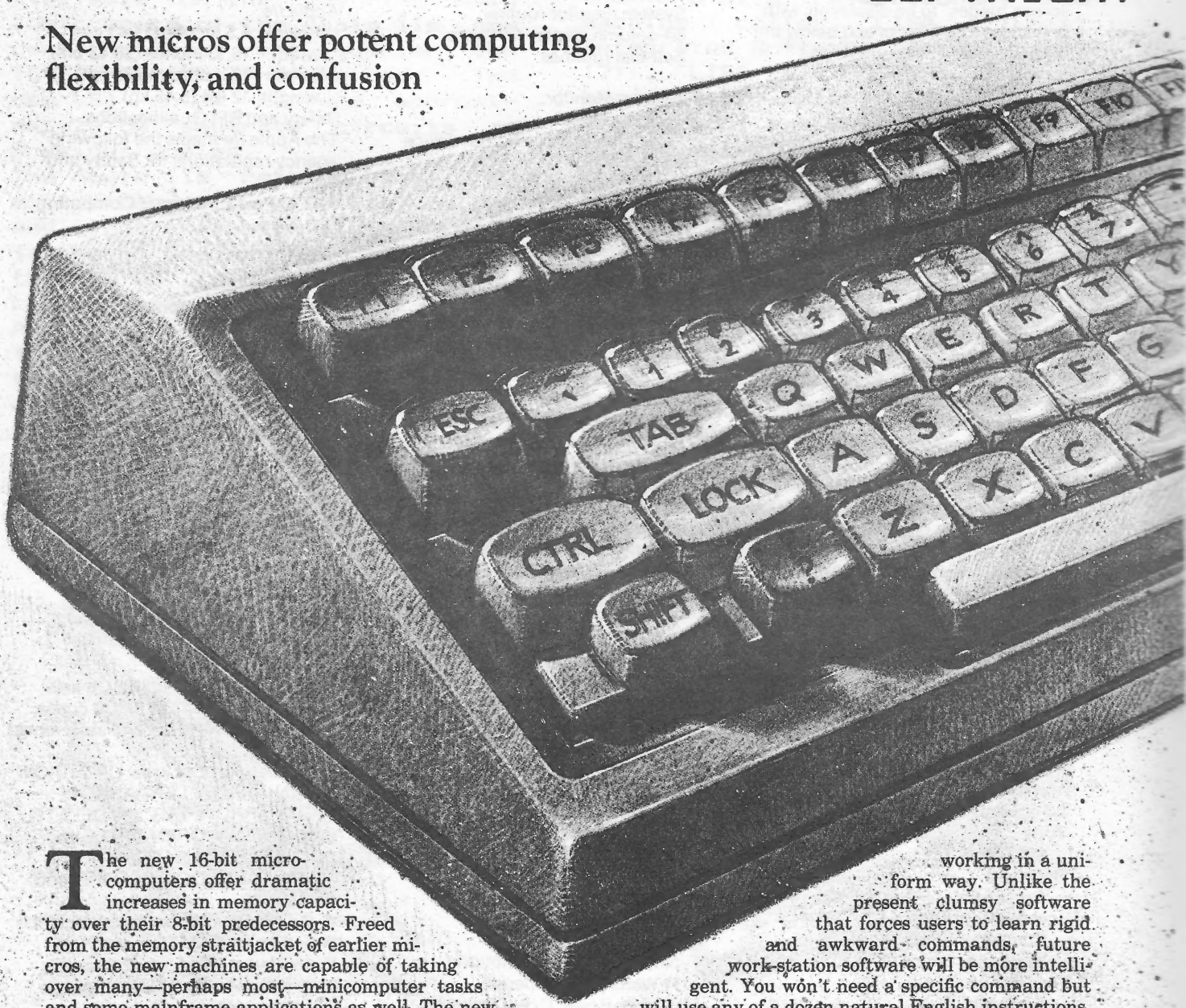
The Apple *IIe* Personal Computer System provides these standard features:

■ typewriter-style, full ASCII keyboard, 63 keys, all 128 ASCII codes, upper and lower case, and auto-repeat feature
■ special-purpose keys: UP-ARROW, DOWN-ARROW, LEFT-ARROW, RIGHT-ARROW, TAB, and DELETE; programmable OPEN-APPLE and SOLID APPLE; plus CONTROL, SHIFT, CAPS LOCK, ESCAPE, and RESET
■ 6502A microprocessor (8-bit CPU)
■ 64K bytes RAM Memory
■ 16K bytes ROM, which includes built-in Applesoft BASIC language
■ color graphics and sound capabilities
■ multi-purpose video and memory expansion slot
■ seven I/O expansion slots
■ high-efficiency switching power supply
■ cassette interface
■ D-9-style input/output connector (used for hand controls)
■ back panel designed for quick connect/disconnect, using D-style connectors
■ internal power-on indicator light on main logic board for safety
■ lockable case lid
■ RFI shielded case

MICROCOMPUTERS: THE SECOND WAVE

by Cary Lu

New micros offer potent computing, flexibility, and confusion



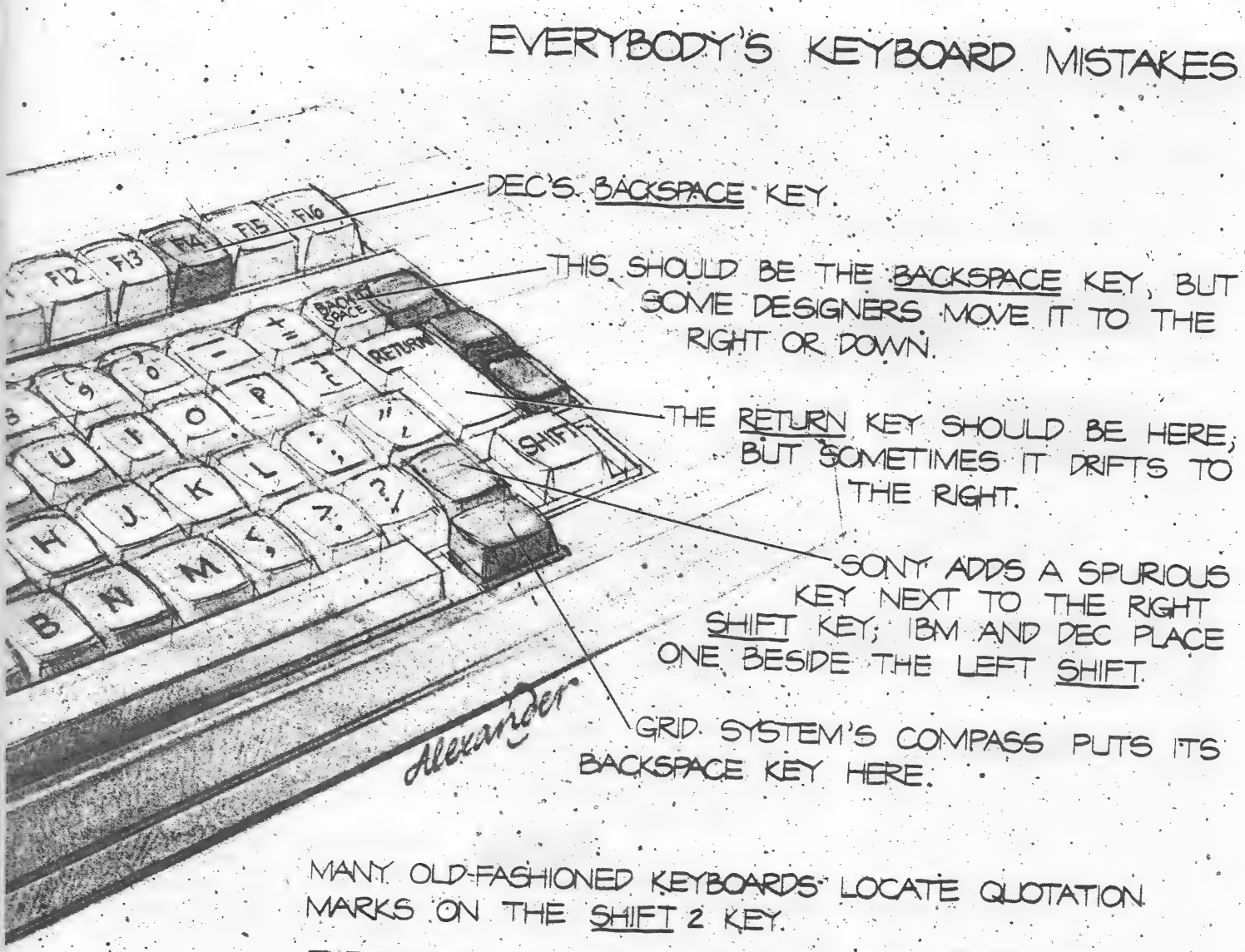
The new 16-bit microcomputers offer dramatic increases in memory capacity over their 8-bit predecessors. Freed from the memory straitjacket of earlier micros, the new machines are capable of taking over many—perhaps most—minicomputer tasks and some mainframe applications as well. The new micros will reshape the office of the 1980s; they will be essential tools for the professional.

The time to buy a second wave micro is now. But choosing among the many machines could confuse any buyer, and even more vendors are coming into the market. This report presents an overview of the available "16-bit" micros, a discussion of their design, a concise explanation of how a microcomputer works (with a definition of terms), and a market outlook.

When decent software finally arrives in two or three years' time, these new micros will turn into easy-to-use, truly integrated professional work stations. They will provide intelligent word processing, convenient electronic mail, rapid financial projections, and instant graphics—all working in a uniform way. Unlike the present clumsy software that forces users to learn rigid and awkward commands, future work-station software will be more intelligent. You won't need a specific command but will use any of a dozen natural English instructions. If you are hesitant or ambiguous, the software will automatically provide assistance. Instead of pausing to type precise commands and waiting for disk drives to load a new program each time you change tasks, you will go smoothly from one application to the next without waiting for disk drives or seeing computer codes on the screen. Unfortunately, for the present, everyone is stuck with inadequate software and cryptic operating systems.

Despite the problems, the technology professional has no choice; master the computers or fall behind. Micros have come in two well-defined generations. Buy at the end of a generation, you get obsolete hardware; buy too early, there is little software. Even with the present state of software, the advantages of the new micros for rapid and flexible

ILLUSTRATION BY STEVEN ALEXANDER



computing are so great that you can't afford to wait.

This report makes several assumptions about users. Professionals need a working tool rather than a family toy. They generally won't write programs, but will rely on packaged software for most applications.

For professionals, it should be one person, one computer. Multi-user or time-sharing systems respond sluggishly when they are up and paralyze whole departments when they are down. With a fleet of micros, the loss of one is not crippling. For the serious user, sharing computers makes no more sense than sharing telephones. Users ought to share data or an expensive resource like a laser printer instead of computers; linking micros together in a local area network makes such sharing practical.

A micro on every desk means that users, not data processing managers, will decide how to use computers. DP managers who oppose micros or recommend lengthy delay before committing to the new machines are only clinging to the past, as computing power inevitably shifts—just as literacy centuries ago—from the priesthood to the people.

What to buy? There is no perfect microcomputer; all designs are compromises. Since all the second-generation micros have a lot of computing power, many buyers might ask just three questions: Is the display comfortable to look at? Are the keyboard layout and "feel" good? Can I get the software I need? These questions will be discussed in detail later.

There may be other considerations. If you are already surrounded by computers, you should adopt the most compatible micro. Then, if the other computers are micros, you can swap disks; if they are minis or mainframes, the vendor might make compatibility a high priority. If you have a large time-shared mainframe, these micros can serve as excellent terminals, relieving the mainframe of many routine tasks and freeing it for more complex jobs.

In the future, neither hardware nor software will be unique for long. Any outstanding feature or clever software concept will turn up elsewhere, often in a matter of months. There are more than a dozen knock-offs of VisiCalc, the best-selling financial spreadsheet program; Fortune offers a rewrite of Wang's popular word processing program.

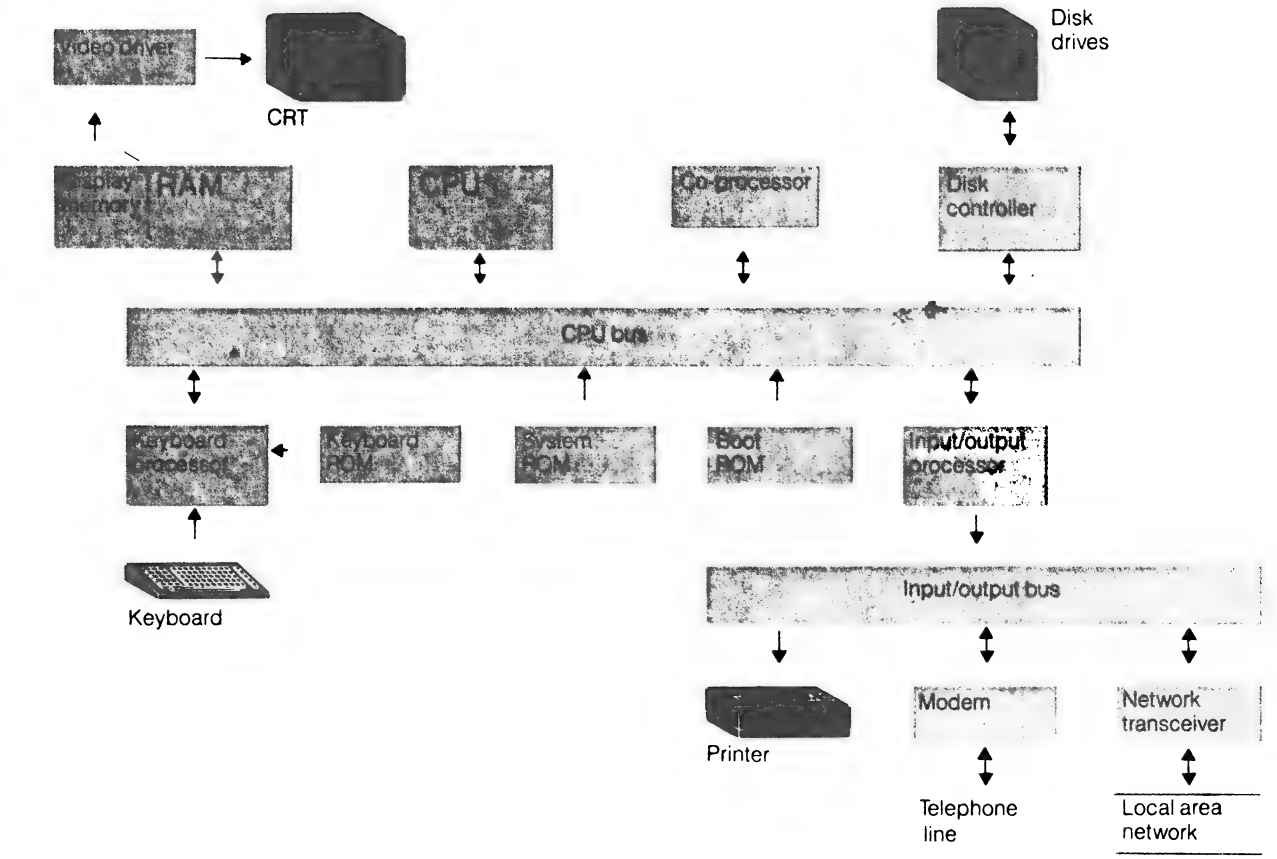
A working system. Minimum microcomputer hardware for the professional user includes a central processor, key-

LETTERING BY BRUCE SANDERS

board, monochrome display, 256 kilobytes of random access memory, two floppy disk drives, and two input/output ports (for a printer and a telephone link). The table lists prices for such a complete system with operating system software.

Most professionals will start with at least three applications programs: a word processor, a financial spreadsheet calculator, and a modem communications program. These are available from many sources at varying prices. In some cases, the computer's purchase price includes software; although often you won't want or need it. The more popular the hardware, the more applications software

How a microcomputer works



This diagram and discussion are for a hypothetical microcomputer; there are many variations.

The business of a microcomputer is handling information. The main information link between its internal components is a set of wires called the **CPU bus.** The bus mainly carries two types of data: Address lines specify where information is headed, while data lines carry the actual information. The more address and data lines there are, the faster information can be processed within the system.

When the computer is turned on, the **boot ROM** (read only memory) sends a simple program to the central processing unit **(CPU)**. This boot program gets things going by instructing the **disk drive controller** to look for information on a particular **disk drive**. That disk contains the operating system **(OS)**.

The OS, a program that "manages" the computer and its peripherals, is read into random access memory **(RAM)**. RAM is an array of semiconductor switches that stores information—a program or data—as bits (1s or 0s). The RAM consists of chips that each store 65,536 bits of information, or 64 kilobits (because computers work with binary numbers, a kilobit is 1024 bits or 2^{10} rather than 1000 bits). A group of 8 bits is a byte; one byte can store one character (a letter, number, or special symbol). A second-generation microcomputer typically has 256 kilobytes or more of RAM. A megabyte is 1000 kilobytes. Often memory systems contain checking and correcting circuits to detect occasional errors caused by electrical noise or even cosmic rays. Note that ROM is fixed storage set by the manufacturer, while RAM storage continually changes as the machine performs tasks.

Once in RAM, the OS operates like a traffic cop, keeping track of everything in memory and managing information to and from peripheral devices such as keyboard, display, and disk drives. Some systems place part of the OS in system ROM. The peripheral devices vary from system to system, so one part of the OS, the basic input/output system **(BIOS)**, may need modification when a device is changed. An OS also includes utility programs for copying or erasing files and other routine tasks.

Applications programs read in by a disk drive pass into RAM under the guidance of the OS. From RAM, the program instructions go to the CPU for execution. The CPU manipulates chunks of information one step at a time in its internal registers, or temporary memory. An instruction might be "take contents of RAM location 123, add 1, and put the result in register B." Each individual instruction is simple; the ability to execute millions

that will run on it. For a few machines, software is available only from the manufacturer—a severe restriction on a machine's flexibility.

Word processing programs written for general purpose microcomputers are rarely satisfactory. Programs frequently do not monitor the available disk space and are often modified from a computer program editor instead of being specially designed for editing English text. Some programs use a clumsy arrangement with many "modes" that can be easy to learn initially, but cumbersome later. Many programs fail to exploit the extensive hardware features of some of the better second-generation micros. Beware: Even a hardware manufacturer's endorsement for a word processing or other program does not assure quality.

No matter where you get your software, you may eventually replace much of it as integrated workstation software appears.

The combination of the micros' novelty, considerable computing power, and the buyers' innocence has allowed many obsolete and/or badly designed hardware and software packages to flourish. Some first-generation micros still sell well, years beyond their prime, because of clever marketing.

When you buy a computer, you are married to its manufacturer, at least for its three or four year lifetime. Is the company's support and service any good? Will it aggressively seek software? Can the firm deliver accessories promptly? Will it stay in business?

Buying all the hardware and software from the computer manufacturer has advantages, but the selection will be limited and the prices high. The vendor will probably have taken some minimal care to insure compatibility, but frequently may have ignored many special features.

Support: It's not free. These micros are sophisticated and complex computers, so virtually everyone will need help sometime. Good support is time-consuming and expensive. The less you pay, the less support you can expect; paying more will not necessarily bring quality support.

The first line of support, the written manuals, varies in quality from bad to abysmal. With recent progress, a few manuals are now mediocre. Too many 500-page manuals have no index, much less a comprehensive, cross-referenced one. Since engineers and programmers rarely write well, and good writers usually aren't interested in the innards of computers or programs, desperate companies have hired writers with neither knowledge of computers nor, it seems often, English. Good documentation is so rare that a case can be made for selecting products on that basis alone.

Poor manuals have spurred a small new growth industry, independents who write replacement manuals for badly-written documentation—selling what should have initially come with the product.

After the manuals, most vendors ask the end user to depend on their computer store, an almost certain invitation to trouble—or disaster. Relatively few people know how to use micros to their full potential. Those who do generally are not those who sell them. The same person who never understood hifi is now trying to pitch computers; it is unrealistic to rely on stores for help.

The retail problems are industry-wide, cutting across all brands. If you can find a dealer organization that understands the products, cherish it. Without a good dealer, you might as well buy the machine the cheapest way possible and find other sources of support.

A well-maintained hotline to the manufacturer provides much better service than most dealers, but many vendors maintain hotlines only for their dealers; the answers to your problems may suffer from double translation.

User's groups, commonly organized around a particular brand of computer, can be very helpful. The members will all be coping with the same problems. Not all members will have useful advice, however; the "hackers" will know the hardware inside out, but won't have any idea of what to do with a computer.

Since the computer itself is a powerful teaching tool, a few products have interactive training software, an excellent idea that sometimes works. No one has carried the idea beyond the simplest steps, though.

Support for the Japanese computers is largely unknown. Many Japanese computers have been shown only as prototypes by their American distributors, who are less interested in the product than in sales. Except from Nippon Electric Company (NEC), useful information is scarce.

The marketplace. After sitting on the sidelines during the 8-bit era, many traditional mainframe and minicomputer manufacturers are now rushing into the market. They join the established vendors and dozens of new startups in competing for what may well be *the* technology growth market of the 1980s. Growth will be much faster than the industry can digest; it may take years before users (and even some manufacturers) understand the true potential of the 16-bit machines.

If the old line data processing types often don't understand micros, neither do many of the new crowd. Time

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of them in rapid sequence makes a computer useful.

Because the CPU executes one instruction at a time (although some fetch the next instruction while executing the current one), its speed is often the limiting factor. For faster computation, some microcomputers have special instructions to turn over time-consuming tasks, such as floating-point arithmetic, to a **co-processor**. The co-processor computes independently of the CPU, freeing the CPU for other tasks.

Information is passed to and from the computer by disk drives, video display, keyboard, printer, and input/output ports. Each dot on the video display corresponds to a bit in the display RAM. The CPU passes information to the display by turning bits on or off in that RAM location. The video driver reads those bits in the sequence they will apear on the cathode ray tube **(CRT)**.

Striking a key on the keyboard closes a switch recording the key's horizontal and vertical position. The **keyboard processor** takes the position information and determines the proper code for the key with a table stored in the **keyboard ROM** and places the code on the data bus. If necessary, the keyboard processor can hold the keystrokes in sequence in a buffer memory until the CPU requests them.

Input/output ports communicate with the outside world, such as a printer or telephone modem. The OS instructs the CPU to send information to an **I/O controller** that then passes the information to the outside device. In some computers the information goes through a separate **I/O bus.** (This can be a simpler bus because the information rate is much slower and there are fewer addresses.) Device drivers connected to the I/O bus can handle information in either parallel form (sending eight bits at a time on eight wires) or serial (sending the bits in sequence on one wire). **Modems** convert the digital bits into a sequence of audio tones for a telephone line. **Local network transceivers** communicate with other computers, printers, and shared disk drives through special wiring.

and time again, one or a few talented people make a hardware, software, or retail operation work. Success can come quickly, but expansion occurs much faster than good people can be found. The fast pace will leave some present successes far behind. Many software developers, including some of the biggest names, have only the most pedestrian ideas of how to use the new computer power. Because their first-generation products sell well, they are making just the minimum allowance for the new micros. If these companies do not change, they will not survive.

The microcomputer market is crowded and confusing. The vendors, old and new, are jockeying products and prices to grab a share of the market. With a year's headstart, IBM has a clear lead in second-generation machines; it alone is shipping in quantity. IBM will enjoy a substantial lead in software and hardware accessories for some time; the competition may never quite catch up. But the IBM Personal Computer does have some frustrating peculiarities. In some cases the later entrants have tried to distinguish their products from IBM's with varying results. Other companies like Eagle and Dynalogic have designed their computers as IBM plug-compatible, able to run exactly the same programs in exactly the same way.

Prices. The price of a working microcomputer system runs from about $4500 to $8000 (aside from Commodore's price-leading $3000 entry), but everyone expects fierce competition with a price war in 1983. As memory and peripheral prices decline, a complete system could be sold profitably for less than $3000 by the end of 1983.

Design. There are no enormous differences among the second-generation micros. To build a micro, everyone, including the biggest names, merely takes chips, disk drives, monitors, and keyboards off various shelves, assembles a few circuit boards, and puts them in a box. All the micros use pretty much the same pieces; only the configuration changes.

The Corvus Concept has a full page display capable of showing several overlaid pages at a time.

The micros fall into a few main classes, and within a class, each design team chose its own compromise in features, performance, and price. To some extent, the price dictates an overall level of performance; adding a feature may be possible only by removing another.

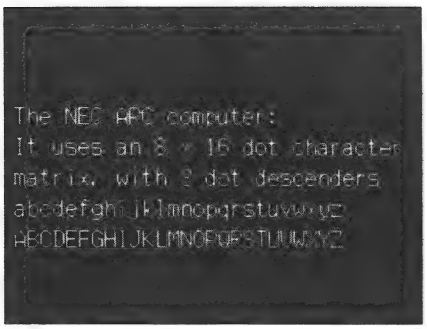
As a buyer, you must make your own compromises, considering the hardware, the software, and the support you will need. Some of it is a gamble. If you buy high quality color graphics, you are betting that you will be able to use it. Even software sold by the computer maker may not exploit the graphics; if it does, you may prefer different software. Most of these micros are so new that there is no clear trend in support of special features.

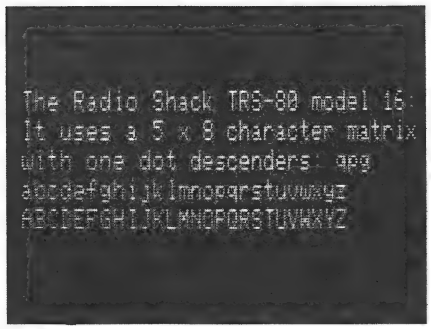
Many second-generation micros are only prototypes now; some problems may well be corrected by the time a machine reaches production; some new problems may be introduced.

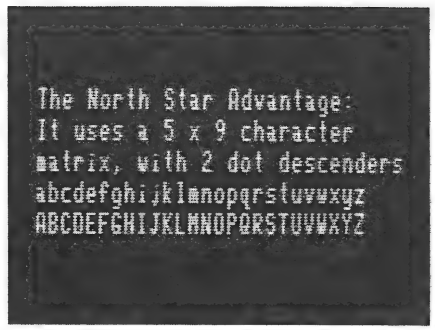
8, 16, or 32 bits? The most common—and sometimes misleading—measure of computing power is the number of bits the CPU operates on at one time. First generation micros have 8-bit processor chips and 64K RAM, so they are unable to run complex programs (a few 8-bit designs have increased the addressable RAM to 256K; this does not make them second generation machines).

The new micros are commonly called "16-bit" computers. The extra bits provide for faster operation and an easier route to greater accuracy in

Six text displays show wide variation in appearance. Of this group only NEC uses an interlaced image. The IBM screens are from two different video drivers. The small text size of the Hyperion fits within its compact display.







numerical computations. The major advantage, however, is the greatly increased RAM. With a megabyte or more of memory address space, intricate programs and high resolution graphics are possible. In addition, the old 64K limit often forced programmers to write in the most compact form, assembly language, a powerful but very tedious method. An assembly language program for one chip type will not run on another. Now the extra memory allows programmers to write quickly in higher level languages that are more easily transported from one computer to the next. Such programs inherently use more memory space than assembler programs, but with the extra memory available, no one cares. This should assure a rapidly growing pool of software for all the more popular machines.

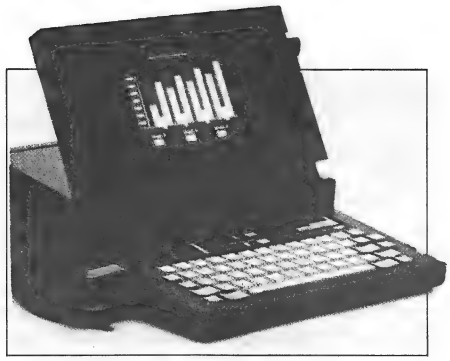
Despite the name, most second-generation micros aren't really 16-bit computers. The confusion stems from the two ways to count a CPU's bit-handling capability: the number of bits passed to and from RAM simultaneously (data bits) or the number of bits manipulated in the CPU's own registers.

The second-generation machines generally use one of three CPU chips: the Intel 8088 or 8086 (88/86 family), or the Motorola 68000.

The Intel 8088, right now the most popular chip, uses 16-bit architecture internally, but handles data on an 8-bit bus; it is an 8/16-bit chip. Its stablemate, the 8086, is a true 16-bit processor, a 16/16 chip. The 8086 will run 8088 instructions and is more powerful and faster because it transfers more data at one time. Both chips will address a maximum one megabyte of RAM.

The Motorola 68000 takes data on a 16-bit bus but does its processing internally 32 bits at a time—a 16/32-bit chip. It can address 16 megabytes of RAM. Faced with that potential size, faint-hearted manufacturers usually make no provision for using all of it. Radio Shack's Model 16 is an upgraded version of a first-generation micro using the 68000; there is no space for more than 512K RAM. Future higher density memory chips will help companies with a space problem.

In addition to bit size and RAM addressing, a third measure of CPU power is internal complexity. This includes the richness of the instruction



Designed more as an intelligent terminal than a free standing computer, the very compact Grid Systems Compass uses a folding flat-screen electroluminescent display.

set (the operations a CPU chip can perform on data in its registers) and the number and size of registers.

By all criteria, the 68000 is much more powerful than the 8088 or 8086. But the Intel chips were developed earlier and 88/86 systems are currently less expensive and have more software running.

CPU chips process instructions at a rate set by the clock speed. Within a chip type, the clock speed sets the overall computational speed. Comparisons across chip types are much less simple, often depending as much on software as hardware.

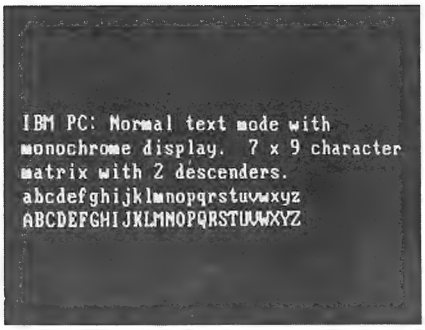
Memory. Because it is the single most important advantage of the new micros, you should get as much memory as you can: 256K is the minimum RAM for a comfortable system and a half-megabyte or more is very desirable. 88/86 machines usually can't run a full megabyte for programs because they reserve part of the memory for the display and system ROM. Many companies underestimate the importance of memory—or are trying to make their computers look less expensive—much as the first-generation companies started out selling machines with 4K memory. Since memory prices will continue falling, you might get along with less than 256K if your present needs are very modest. While existing software—most of it literally translated from first-generation machines—takes little advantage of the extra address space, future applications will grow with the memory available. Some software will use more memory for helping the user than for the program proper.

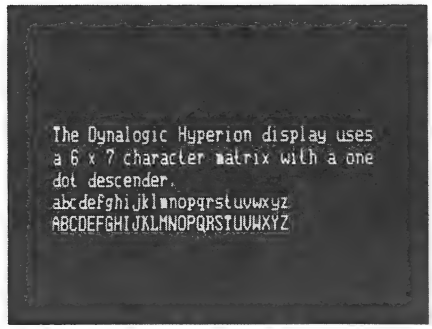
Is one megabyte enough? Some argue that it is more than single users need. One megabyte does allow for moderately sophisticated computing, indeed much more powerful computing than many expensive minicomputers. Yet the history of computers shows that everyone runs out of memory sooner or later. And users who want to do several tasks simultaneously (multi-tasking)—for example, writing on a word processor, checking the spelling, and sending the message electronically, all without going to a disk drive—will need more memory.

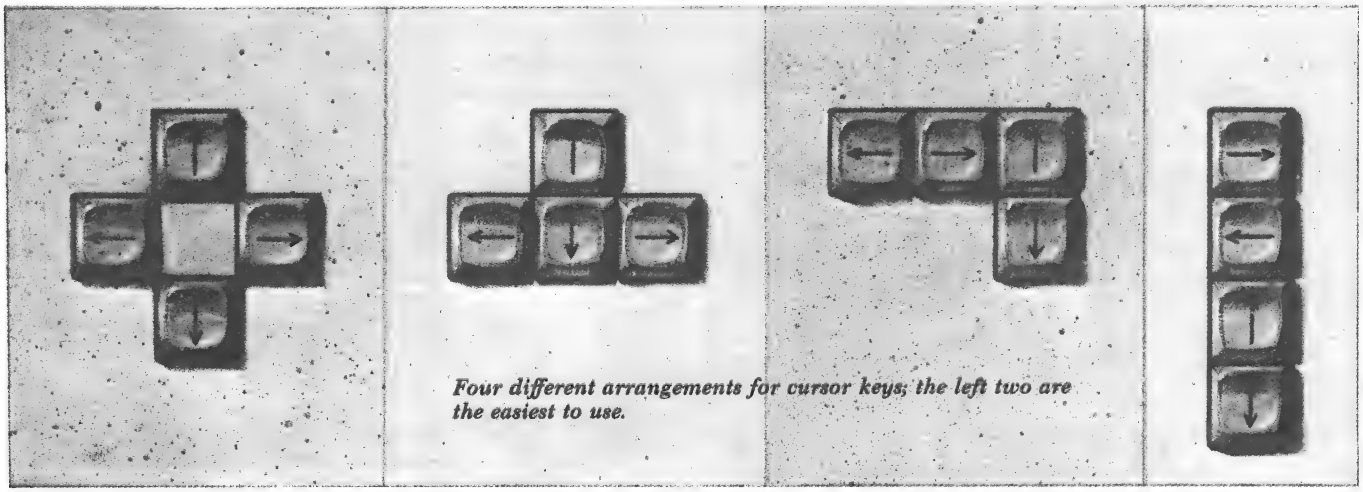
Operating systems. The operating system (OS) ties the main processor and memory to the display, keyboard, and disks.

The present operating system chaos is the greatest single barrier to efficient use of micros. The successes of most operating systems were historical accidents; they were never intended for general use.

Nearly all operating systems are incompatible; even identical OS and CPU chips do not assure the exchange of programs between different brands of computers (unless they are plug-compatible), although they facilitate the transfer. One problem is the different way each computer controls its display—each brand has a different instruction to erase a line on the screen, for example. If one OS type appears for different CPU chips, the user commands may be the same, but







Four different arrangements for cursor keys; the left two are the easiest to use.

STEVEN ALEXANDER

again programs usually won't run without modifications.

For the 88/86 family, two primitive and very similar single-user operating systems live in uncomfortable coexistence: MS-DOS from Microsoft and CP/M-86 from Digital Research. Although incompatible, both are derived from an 8-bit OS, CP/M-80. In their present form, CP/M-86 is more adaptable to multi-tasking while MS-DOS has better error recovery. Both are limited because they are designed to work in minimal RAM. Both are undergoing major revisions now but neither is capable of fully exploiting the new micros.

Two other operating systems have hung around the fringes: the p-System and Oasis. Originally designed for the Pascal language, the p-System appeals mainly to programmers. Oasis is intended for multi-user business computing; its high entry cost discourages widespread use. Both have many users and growing software catalogs, but thus far have not achieved real success.

The widely heralded Unix OS from Bell Labs could represent the future. Unix has appealed mainly to programmers, but it is beginning to win other users. Versions of Unix will run on all the major CPU chips (8/16 and up).

(There are several computers sold only with a proprietary OS. If these machines become very popular, then software will be forthcoming; if not, there will be little software unless third parties make a standard OS available.)

Promises of future "upward migration," or upgrading from present to more sophisticated operating systems, reveal many problems on close inspection. Just how the OS problems will be resolved is very unclear.

Displays. While their internal hardware may be similar, the new micros differ considerably in their human interface—their displays and keyboards. Because they are used so intensively, you may want to choose a micro based on these components.

To the casual observer, the biggest improvement of the new micros over the old is the far higher quality graphics made possible by large quantities of RAM. Graphics display design brings in many complicated issues; first we will consider the simpler matter of text display.

There is no perfect microcomputer; all designs are compromises.

Especially after a long day's use, text display must be clear and comfortable to read. Comfort includes an aesthetic component and individual preference; some displays are unsatisfactory for most users.

The number of text lines on the screen defines the lower limits of an acceptable display. The minimum number of dots needed for a reasonable typeface is 5 dots wide by 7 dots high plus two more dots below the baseline for descenders (the lower case *p, g, q,* and *y*)—a total 5 × 9 character matrix. A one-dot descender forces the *p, g, q,* and *y* up a scan line for clarity, making a "bumpy" typeface that reads badly. Including a separator line, a screen with 25 text lines calls for 250 scan lines. Having fewer scan lines sacrifices text lines, degrades the typeface, or gives up the separator line. Designers use all three compromises; all are unsatisfactory.

Higher dot densities on some computers allow serifs on the typeface. Although the characters look more like printed text, the dot density is insufficient for attractive type or serifs on the small *m* and *w*. The resulting display looks as if it was printed by a typewriter with misadjusted keys. Odd-looking typefaces may shorten the letter *i* or distort other letters; compare carefully as the bad typefaces do not improve with age.

There are two fundamental ways to generate characters on the screen: in text or graphics mode. In text mode, characters in memory are decoded by a ROM that contains the dot matrix for each letter. To change text on the screen, the CPU merely alters one byte in memory. Graphics mode uses a "bit-mapped" screen. In such a display, a block of RAM is reserved for the image; each bit in the RAM corresponds—is mapped—to a dot or pixel (picture element) on the screen. By setting each bit on or off in turn, the CPU paints an image. To change a character, the CPU must change 10 bytes of memory for an 8 × 10 pixel character cell (5 × 9 matrix plus separator pixels). Thus computers displaying text in graphics mode may take up to two seconds to rewrite the screen. A fast text mode takes only a tenth of a second or less. (Updating speed can also depend on the software).

There are nevertheless advantages to a pure graphics mode, aside from saving the cost of some ROM. With suitable software, adequate resolution could enable direct display of proportional spacing, Greek letters, and equations.

IBM hedged its bets by making two video driver boards: a color graphics one with a bumpy typeface and touching letters, and a monochrome text mode board with a more legible, higher resolution display—but no graphics. Other companies use the same video driver for both monochrome and

color; if there aren't enough scan lines, their text display is unsatisfactory in both modes.

Some computers have an alternate condensed mode of text display. By reducing typeface size and legibility, a year's worth of financial tables can be packed onto the screen. Corvus doesn't need to pack; its large CRT shows many more characters and can even be turned sideways to change the aspect ratio. But its standard characters are very small and many users will prefer an alternate larger typeface.

A single on/off bit for each pixel may be sufficient for monochrome graphics, while two bits per pixel allow four brightness levels (off, low, medium, high). In color, more bits are necessary to store the color of the pixel and sometimes its brightness and plane. The CPU can overlap images by setting the plane of each pixel in the background or foreground. Most micros use the main CPU to compute the display, so the computer may run slowly when generating graphics. By writing the display with a secondary CPU, a few micros run faster.

Because bit-mapped graphics consume so much memory, many color displays trade off resolution and the color palette. In high resolution they might offer only four color choices per pixel and in lower resolution 16 colors. Many designs make graphics an accessory. Commodore has no bit-mapped option; it uses geometric blocks in place of letters to patch together simple graphics.

Nowhere are the designer's compromises clearer than in color graphics. Higher quality requires more pixels and more colors—and more memory, which increases costs and may reduce the memory available for programs. More pixels means more computation and a slower display.

The display quality, especially in color, is often limited by the need to use reasonably-priced CRTs derived from broadcast television designs. However, ordinary televisions (and even professional monitors with direct video inputs) cannot display the high resolution color images clearly. Only high bandwidth monitors, with a separate input for red, green, and blue (RGB input) are adequate.

Some micros generate as many as 800 pixels on each scan line, more than most monitors can display distinctly, although such resolution aids positioning.

North American and Japanese televisions display 30 complete frames per second of about 480 lines each (the usual count of 525 lines includes the black bar between frames). A display with 30 images per second will flicker badly, so each frame is split into two 240-line interlaced fields, one with the even-numbered lines, the other with the odd-numbered. Showing 60 fields each second suppresses flicker.

Most microcomputer displays normally use 200 to 240 scan lines, with identical rather than alternating fields. Displays with more than 250 lines are generally interlaced; some computers offer both an interlaced and a non-interlaced mode. (More than 250 lines without interlacing calls for very expensive monitors.) Since interlacing puts separate information on alternate video fields, the fine details will flicker at 30 Hz unless the monitor has phosphors selected for longer persistence. The Victor 9000 (designed by Sirius Systems Technology) reduces the flicker of its interlaced image by increasing the framing rate to 38 Hz.

Color displays of text present a visual problem: Because the eye lacks color correction, the slight refocus needed for different colors may induce fatigue early. Word processing users will probably prefer monochrome displays.

Keyboards. As with the display, you will spend a lot of time with the keyboard. A good keyboard will make that time pleasant; a bad one is a burden. Detachable keyboards, now common, adapt more easily to individual work habits; low profile keyboards, with keys an inch or two above the desk surface, allow more comfortable placement of hands than traditional higher keyboards. Only after typing for some time can you judge keyboard comfort and feel. While Japanese designers concentrate on high quality graphics because of their script, they usually make poorer keyboards because few Japanese type.

For better or worse, we are stuck with the QWERTY keyboard, designed not for efficiency but to avoid jammed keys on mechanical typewriters. Although every machine has such a keyboard, many differ in details from the de facto standard keyboard for the English-speaking North American market, the IBM Selectric typewriter's.

Keyboard designers often don't understand the importance of standard keyboards. Many assert there is no standard, although a quick walk around any office will reveal the obvious truth. Anyone can adjust to one non-standard layout, but most people will need to use several different keyboards.

One problem is that a typewriter typically has 88 characters, but a computer has 94 or 96 and so needs more keys. These rarely-used keys should be placed outside the typewriter keyboard area, but many designers try to squeeze them inside by moving the BACKSPACE or carriage return key to the right.

There is only partial agreement on where to place two important computer keys, CONTROL and ESCAPE. The CONTROL key works like a second shift key; you hold it down while typing something else. Most keyboards place it on the left near the shift key. ESCAPE is a special character often used for a command; it should have its own key, usually above the TAB key. The ESCAPE key is missing on the Wang; you must type CONTROL and another key instead.

The Dynalogic Hyperion is a portable IBM plug-compatible unit that closes up into a package small enough to carry on an airplane.

Second generation microcomputers

Manufacturer/Model	Production or prototype	Central processing unit (CPU)			Random access memory			Operating systems		
		CPU chip	Clock speed (MHz)	Co-processor?	Standard (kilobytes)	Present maximum	Future maximum	Standard	Alternate	CP/M-80 capability/cost
Commodore BX256	Proto	8088	5	8087 Opt	256K	896K	896K	CP/M-86		Opt
DEC Rainbow 100	Proto	8088	4.8	No	64K	256K	768K	CP/M-86	MS-DOS	Incl
Dynalogic Hyperion	Proto	8088	4.77	8087 Opt	256K°	256K	640K+° 192K	MS-DOS		No
Eagle 1600	Proto	8086	8	8087 Opt	128K	512K		CP/M-86 MS-DOS		No
Grid Systems Compass	Proto	8086	5	8087 Incl	256K		512K	Compass		No
Hitachi Personal Computer	Proto	8088	4.77	8087 Opt	128K	384K		MS-DOS		
IBM Personal Computer	Prod	8088	4.77	8087 Opt	16K	256K	640K+° 192K	MS-DOS	CP/M-86 P-system	3rd party
Mitsubishi Multi 16	Prod	8088	4.44	8087 Opt	128K	384K	512K	CP/M-86 MS-DOS		No
NEC Advanced Personal Computer	Prod	8086	5	8231 Opt	128K	256K	(1M)	CP/M-86 MS-DOS		No
North Star Advantage 8/16	Proto	8088	8	No	128K	256K		MS-DOS	CP/M-86	Incl
Sony SMC-70 + SMC-7086	Proto	8088	5	8087 Opt	128K			MS-DOS CP/M-86		Incl
TeleVideo 1602	Proto	8088	5	8087 Opt	128K	256K	(1M)	CP/M-86		No
Toshiba T300	Proto	8088		8087 Incl		512K		MS-DOS CP/M-86		No
Vector Graphic 4	Proto	8088	5.1	No	128K	256K		MS-DOS	Oasis	Incl
Victor 9000	Prod	8088	5	No	128K	256K	896K	CP/M-86 MS-DOS		Opt
Wang Professional Computer	Proto	8086	8	8087 Opt	128K	640K	640K	MS-DOS		Opt $1000
Zenith Z110	Proto	8088	5	No	128K	768K	768K	MS-DOS	CP/M-86	Opt $150
Corvus Concept	Prod	68000	8	No	256K	512K	(16M)	Corvus		Opt $295
Fortune 32:16	Prod	68000	6	No	256K	1M	(4M)	Unix System III		Opt
Radio Shack Model 16	Prod	68000	6	No	128K	512K		TRSDOS-16		3rd party
WICAT 150WS	Prod	68000	8	Opt	256K	1.5M		MCS	Unix System III	Opt
Apple LISA	Prod	68000	5		1024K	N/A		Apple	6x Appl.Packages in ROM	

Footnotes ° User memory for the IBM Personal Computer and Dynalogic Hyperion comes in two separate segments.

Explanations of table entries

These are representative single-user microcomputers; the list is not complete. Multi-user computers are not included.

The computers are grouped by CPU chip type.

All information on the table is based on manufacturer-supplied components. Third party accessories, generally at lower cost, will be available for the most popular computers.

Co-processors calculate floating point arithmetic with suitable software, thus freeing the CPU for other chores.

The "future maximum" RAM may in some cases require external hardware in addition to more memory chips.

The standard operating system is the one principally supported by the manufacturer; alternate OS are sold with less enthusiasm. Compass, Corvus, PCOS, and MCS are proprietary OS. CP/M-80 is an 8-bit operating system; prices include both software and hardware as required.

Alternate mode text displays have higher density and lower legibility. The figures for the Corvus Concept, however, are for its horizontal and vertical display orientations.

The character matrix counts the actual dots used to form a character, including descenders. Dots of descenders are counted

Text display		Graphics resolution		Keyboard					5" disc		8" disc		Winchester
Lines x cols/ Alt mode	Char matrix/ Dots of des	Monochrome/ Cost	Color/ Cost	Type/ Separate?	Total keys	Soft keys	Cursor keys	Numeric keypad	Number incl/ Max number	Storage	Number incl/ Max number	Storage	Size, storage/ Cost
25 x 80		Block only	Not avail	−2	94	10	Yes	Yes	2	170K	Not avail		
24 x 80 24 x 132	5 x 9 2 des	240 x 800 $845	240 x 800 Incl w/b&w	−2 ! Yes	103	20	Yes	Yes	2 4	400K	Not avail		5", 5M $3500 + adaptor
25 x 80	6 x 7 1 des	250 x 640 Incl	Opt	−1 ! Yes	84	10	Combined		2	320K	Not avail		5", 10M
24 x 80	7 x 9 2 des	240 x 340 Opt	Opt	−2 ! No	95	14	Yes	Yes	2 4	780K	Not avail		5", 10M
24 x 53	5 x 8 1 des	240 x 320 Incl	Not avail	−1 ! No	53	0	Yes	No	0 16	800K	Not avail		5", 5M $3200
25 x 80	5 x 8 1 des	200 x 640 • Incl	200 x 640 • Incl	−3 ! Yes	96	10	Yes	Yes	1 4	320K	0 2	1M	
25 x 80	7 x 9 2 des	200 x 640 $300	200 x 320 Incl w/b&w	−2 ! Yes	83	10	Combined		0 4	320K	No		
25 x 80	(6 x 14)	400 x 640 Incl	400 x 640 Incl	−2 Yes	94	10	Yes	Yes	2 2 or 4	300K	0 2		5", 7.2M
25 x 80	8 x 16 3 des	475 x 640 $635	475 x 640 $2100 w/monitor	−1 Yes	108	22	Yes	Yes	Not avail		2 4	1M	
24 x 80	5 x 9 2 des	240 x 640 Incl	Not avail	Std No	88	15	Combined		2	360K	Not avail		5", 5M
25 x 80		400 x 640 Incl	200 x 640 Incl	−3 ! No	72	6	Yes	Opt $90	2 [3½"] ▼	280K	Opt		5", 5M $3195
24 x 80	5 x 8 1 des	240 x 640 Incl	Not avail	−2 Yes	111	16	Yes	Yes	2	360K	Not avail		5", 7.4M
25 x 80		400 x 640 Incl	400 x 640 Incl	Yes	98	10	Yes	Yes	2	(1M)	Not avail		
25 x 80	7 x 12 3 des	312 x 640 Incl	312 x 160 Opt	−1 Yes	91	15	Yes	Yes	2	630K	Not avail		5", 5M ~$2000
25 x 80 50 x 132	7 x 13 2 des	400 x 800 Incl	Not avail	Std Yes	96	7	Yes	Yes	2	610K or 1.2M	Not avail		5", 10M $4495
25 x 80		300 x 800 $250	250 x 640 $650	Std Yes	101	16	Yes	Yes	1 2	320K	Not avail		5", 5M ~$3500
25 x 80	5 x 8 1 des	225 x 640 △ Incl	225 x 640 △ $320	−1 No	96	15	Yes	Yes	2 4	320K	0 4	1.2M	5", 5M
56 x 120 72 x 90	5 x 9 2 des	560 x 720 Incl	Not avail	−1 Yes	91	10	Yes	Yes	0 8	140K	0 8	600K	5", 5.7M $3200
25 x 80	5 x 9 1 des	480 x 800 ~$1000 w/monitor	480 x 800 ~$3500 w/monitor	Std Yes	99	17	Yes	Yes	1 4	800K	Not * avail		5", 5M $3995
24 x 80	5 x 8 1 des	240 x 640 $499	Not avail	Std Yes	76	2	Yes	Yes	Not avail		1 4	1.2M	8", 8M $4495
25 x 80	7 x 10 1 des	300 x 400 $900	Not avail	−1 Yes	82	4	Yes	Yes	1 4	630K	No		5", 10M
40x132		364x720		Yes	77		Yes	Yes	2	1.36M			5,5M

•Interlaced graphics (400 x 640) optional. !Serious problem. ▼The Sony also can use 5"and 8"disks. △Interlaced graphics (500 x 640) optional.

from the baseline of the text, rather than on the characters themselves. The figures do not always agree with manufacturer's specifications.

Graphics resolution figures indicate the highest resolution available in monochrome and color. Most systems have limited color choices and other restrictions at the highest resolution. Some systems have lower resolution modes. Monochrome graphics use the standard CRT display unless noted. Color monitors are not included in the listed price unless noted.

Keyboard type is the number of keys different from the IBM Selectric keyboard layout. Keyboards with serious problems are explained in the main text. The soft key count includes only those keys set aside for general purposes.

The disk drive storage figure refers to usable storage after formatting. Winchester drives are optional for all but Grid Systems Compass, Corvus Concept, and Wicat 150WS.

The footprint is the desk top area, in square inches, occupied by a complete system.

User hotlines give the end user direct telephone access to the manufacturer to ask technical questions.

Second generation microcomputers (continued)

Manufacturer/Model	Input/Output: Serial ports incl	Input/Output: Parallel ports incl	Footprint, sq inches	Disclosure: Hardware details	Disclosure: Operating syst BIOS	Sales channels	User hotline	Standard system□: Cost	Standard system□: Total disk memory	Number of Pieces	Notes
Commodore BX256	1	1	468	Yes	Not set	Stores Mail order	Yes	$2995	340K	2	Serial terminal
DEC Rainbow 100	2	0	472	Yes	Yes	Direct Stores	Yes	$4590	800K	3	
Dynalogic Hyperion	1	1	285	Yes	Yes	Direct Stores	Yes	$4995	640K	2	IBM plug-compatible
Eagle 1600	0	1	378	Yes	Yes	Stores	No			1	IBM plug-compatible
Grid Systems Compass	1	1	172.5▽ + disks	No	No	Direct	Yes	$11,350 w/Winchester	5.8M	1 or 2	
Hitachi Personal Computer	1	1	749	Yes	Not set		Yes			3	
IBM Personal Computer	0	0	456	Yes	Yes	Direct Stores	No	$4975	640K	3	
Mitsubishi Multi 16	Up to 5 ports		407	Not set	Not set					2	
NEC Advanced Personal Computer	1	1	552	Yes	Yes	Stores	No	$4848	2M	2	
North Star Advantage 8/16	1	0	374	Yes	Yes	Stores	No	$5220	720K	1	
Sony SMC-70 + SMC-7086	1	1		No	No	Stores	No			>3	Multibus
TeleVideo 1602	2	0	482	No	Yes	Stores	No	$4995	720K	2	
Toshiba T300				No	No	Stores	No			3	
Vector Graphic 4	2	1	420	Yes	No	Stores	No	$5190 + OS	1.2M	2	S-100, I/O only
Victor 9000	2	1	335	Yes	Yes	Stores	Yes	$5890 $6790	1.2M 2.4M	3	
Wang Professional Computer	1	1	450 306 opt	Yes	Yes	Direct	Yes	$5045	640K	3	
Zenith Z110	2	1	375	Yes	Yes	Direct Stores	Yes	$4650●	640K	1 or 2	S-100, I/O only
Corvus Concept	2	0	440	Yes	Yes	Stores	No	$5095 $8695	280K 5.8M w/Winchester	3	Apple bus
Fortune 32:16	1	0	461	Yes	No▲	Direct Stores	No	$6385	800K	3	
Radio Shack Model 16	2	1	490	Yes	No	Company stores	Yes	$6327	2.5M	2	
WICAT 150WS	2	1	471	Yes	Yes	Direct	Yes	$9450 w/Winchester	10.6M	2	Serial terminal
Apple LISA	2	1	384	Yes	Not Yet	Stores		US$1K	1.36M	3	

Footnotes:

● Interpolated price for 256K RAM. The computer's design makes 192K or 448K RAM more cost-effective.

▲ Publishing of operating system information is restricted by Western Electric license terms.

▽ Grid Systems Compass is designed for use with telephone links. Accessory disk drives require more desk space.

□ A basic system includes 256K RAM, two disks, two ports, and an operating system.

Manufacturers' addresses

Commodore, 487 Devon Park Dr., Wayne, PA 19087 (215) 687-4311
Corvus, 2029 O'Toole Ave., San Jose, CA 95131 (408) 946-7700
Digital (DEC), 129 Parker St., Maynard, MA 01754 (617) 897-5111
Dynalogic, 141 Bentley Ave., Ottawa, CANADA K2E 6T7 (613) 226-1383
Eagle, 11570 Martens River Circle, Fountain Valley, CA 92708 (714) 957-1711
Fortune, 1501 Industrial Rd., San Carlos, CA 94070 (415) 595-8444
Grid Systems, 2353 Garcia Ave., Mountain View, CA 94043 (415) 961-4800
Hitachi, 401 West Artesia Blvd., Compton, CA 90220 (213) 537-8383
IBM, P.O. Box 1328, Boca Raton, FL 33432 (800) 447-4700
Mitsubishi, Denki Bldg., Marunouchi, Tokyo 100 JAPAN Telex: J24532
NEC, Five Militia Dr., Lexington, MA 02173 (617) 862-3120
North Star, 14440 Catalina St., San Leandro, CA 94577 (415) 357-8500
Olivetti, 155 White Plains Rd., Tarrytown, NY 10591 (914) 631-8100
Radio Shack, 1500 One Tandy Center, Fort Worth, TX 76102 (817) 390-3011
Sony, 7 Mercedes Dr., Montvale, NJ 07645 (201) 573-8899
TeleVideo Systems, 1170 Morse Ave., Sunnyvale, CA 94086 (408) 745-7760
Toshiba America, 2441 Michelle Dr., Tustin, CA 92680 (714) 730-5000
Vector Graphic, 500 N Ventu Pk. Rd., Thousand Oaks, CA 91320 (805) 499-5831
Victor, 3900 N Rockwell St., Chicago, IL 60618 (312) 539-8200
Wang, One Industrial Ave., Lowell, MA 01851 (617) 459-5000
Wicat Systems, 1875 South State St., Orem, UT 84057 (801) 224-6400
Zenith Data Systems, Hilltop Rd., St. Joseph, MI 49085 (616) 982-3200

Other keyboard problems are more severe. There appears to be no truth to the rumor that IBM's keyboard designer has a left hand with six fingers, but its Personal Computer puts an extra key between *z* and the left shift key, a very annoying change from the company that set the standard. Sony made a similar mistake, except next to the right shift key.

Not only did DEC repeat IBM's spurious key, its treatment of the BACKSPACE key on its prototype Rainbow 100 is confusing. A computer sees distinct functions for a BACKSPACE and a DELETE key. DEC is trying to stay compatible with its earlier products, so hitting what looks like the BACKSPACE key simply repeats the last character on the screen. The true BACKSPACE is above the keyboard in another set of keys. Even senior DEC software people consider the prototype keyboard unacceptable.

Problems cripple other keyboards. Eagle and Dynalogic drop the BACKSPACE key down one row of keys. The BACKSPACE key sits to the right of the space bar in Grid Systems' portable Compass. Grid at least has the excuse of needing to fit its keyboard into a very small space.

Soft keys. Outside the main keyboard area, all the second-generation machines have secondary keys. Function keys ("soft keys") can be defined in software for any purpose; they provide quick access to special commands, moving the text forward or backward, deleting a sentence or paragraph. For an adequate number of commands, you need at least ten soft keys, and the more the better. Cursor keys move the cursor around the screen and a numeric keypad speeds numerical entries. A few machines combine the last two functions; for example, a left cursor movement shares the *4* on the numeric keypad; the software selects the mode. This is less satisfactory since you often need both cursor movement and the keypad.

Some people oppose soft keys, citing studies showing that production typists slow when they move their hands away from the keyboard "home" position. Yet the soft keys aren't used during high-speed keyboard entry, but rather during editing or other tasks when much more time is spent thinking than typing. Most users, given the choice, prefer soft keys.

Because some software doesn't use soft keys or uses them badly, the determined user might seek out a machine with a redefinable keyboard. Although these keyboards are very flexible, such measures can cause confusion.

Disk drives. RAM is quick, relatively expensive, and volatile—its contents disappear with the power cutoff. Disk drives serve for long-term memory and reading in software. Disks vary in size (five or eight inches) and storage capacity, but to save space, most companies supply five-inch drives. Storage capacity varies with the density of recording, the number of tracks per inch (tpi), one- or two-sided recording, and the size of the disk. The storage ranges from 140K (single sided, single density, 48 tpi) to 650K and more (double sided, double density, 96 tpi). With an unusual variable speed drive controller, Victor packs 1.2 megabytes on a 5-inch floppy. Generally, the more storage the better. But the more conservative companies stop short of using 96 tpi because of reliability problems—the disks themselves swell with changing humidity and temperature so the tightly packed tracks shift places. Eight-inch disks commonly and reliably store about a megabyte.

Some new microcomputers have greatly improved high resolution color displays—for example, NEC's Advanced Personal Computer with an interlaced 475 by 640 pixels image.

Future disk drives will store even more; up to five megabytes on five-inch floppies are projected in the next few years using present technology, but users whose data are valuable may want to follow a step or two behind in the race towards higher density storage.

While all five-inch floppies are the same physical size, there are nearly as many formats as manufacturers. Following computer industry tradition, the formats are nearly all mutually incompatible. IBM has now set a de facto standard for five-inch disks—actually two (incompatible) standards, one for MS-DOS and the other for CP/M-86. Several manufacturers, including Wang, North Star, and Zenith, say that they will have conversion software at least able to read IBM disks. This conversion will be mainly useful for text files; programs generally won't transfer without modification. In the eight-inch size, a fairly standard format for CP/M-80 will carry over to CP/M-86, but no standard holds for MS-DOS.

While convenient, floppy disks are much slower than the newer Winchester rigid disks. Instead of thin flexible plastic, Winchesters use machined aluminum platters coated with a magnetic surface. Because the disk surface is usually sealed inside a dust free environment, the magnetic heads can sweep near the surface without touching it. The storage capacity is high—typically five megabytes or more. As the media is not usually removable, interchangeability is not an issue. Companies that do not have Winchesters now will undoubtedly offer them in the future. Because they see a captive market, computer firms tend to set high prices for their Winchesters, much higher than the many third party vendors. A potential disadvantage of the third party vendor is the necessary alterations to the operating system for a new peripheral device. Such non-factory changes may cause difficulty with multiple (or future) operating systems and other peripherals.

Much faster than any mechanical disk drive are solid state add-on memories—a bank of RAM chips set up to

look like a disk drive to the computer. As with main memory, the RAM disk contents are lost when the power is turned off. Some future RAM for portable computers may retain memory with a battery when the main power is off; such chips are expensive now.

Input/Output. Most users will need at least two ports, one for a printer and the other for a modem. Plugging in a printer can be very complicated: Almost all serial ports follow the RS-232C "standard." That standard guarantees only that the plugs will physically fit together (and sometimes not even this). Both printer and computer may be RS-232C, but a determined user may spend weeks getting the system to work. The problems are the multiplicity of baud rates (the number of bits transmitted per second), hardware handshaking schemes (the computer must know when to stop sending data periodically to avoid overrunning the printer), and access to special features, such as boldface type. For proper operation, the computer, OS, software, and printer must all work together. The salesperson's confident "they're serial and are compatible," is not sufficient. The only convincing evidence is watching the components work together as a unit. Even then, there will probably be trouble with the next piece of software you buy....

Telephone modems are a little simpler. Most work on serial ports and the hook-up is straightforward—but no one agrees on the protocol. Every computer seems to use a slightly different dialect, so you (or the other party) must fiddle with stop bits, parity checks, and a half dozen other variables. Good software will give you easy access to all variables; some skill and experience will help.

Growing in importance, local area networks are communications pathways that connect computers, large disk drives, printers, graphics plotters, and nearly everything else. Through the network you can share files with colleagues or send messages. Some networks are used by one company's products alone; they are not a wise investment. Invest instead in the networks that support many different products. In the micro world, the Corvus Omninet is the leader; it is relatively cheap and can communicate with much more elaborate systems such as Ethernet through a gateway.

System accessories. For routine applications, the internal design of the computer is not particularly important. The serious user, however, should be concerned with expandability. Some designs lend themselves to expansion better than others. The key feature is a "bus," where the circuit lines of the CPU's input/output are attached to multiple pin sockets ("slots"). Accessories on cards plugged into these sockets can communicate directly with the CPU. All computers have a bus but they're inaccessible in some designs.

Most companies use a bus configuration peculiar only to their design, so accessories will come slowly—if at all. Adaptation of one bus to another is usually impractical. The most flexible buses are the several semi-standard industry buses, such as the STD, Multibus, S-100, or the IBM. Corvus adopted the bus from the Apple II. Many interesting accessories from different manufacturers are available for these buses, but the lack of tightly followed industry standards means that getting everything to work together is often a struggle, both in hardware and software.

Operating system chaos is the biggest problem.

Some computers require that you use slots on their bus even for such basic features as input/output ports, and you may find the slots quickly filled up ("slot-bound"). Bus extenders, where available, are both expensive and space-consuming.

Even more drastic changes are possible for some machines. An add-on board can change the CPU itself—getting the 68000 to run on a machine designed for the 8088, for example. Unless they are very successful and well-supported, such adaptations usually run into compatibility and software problems.

Where should you buy accessories, from the computer vendor or from a third-party? Buying from the computer vendor usually—but not always—insures the highest degree of compatibility at the highest price. Independent companies will probably develop accessories more quickly than the manufacturer, and will also offer interesting features; such accessories will appear only for the most popular computers. If you have problems, however, there may be finger pointing. The independent will insist the fault lies with the computer, whose manufacturer will blame the accessory.

Publishing details. Some vendors seek to control their product and compel users to buy accessories only from them. North Star, for example, had used the S-100 bus for its earlier (first-generation) machines, but in announcing the new Advantage computer to its dealers, North Star pointed to its proprietary bus, promising that buyers will have to return to the dealers for accessories unavailable elsewhere.

The idea that the computer vendor can completely control its product dies hard. Companies as diverse as Atari and Texas Instruments tried to keep the operating details of their home computers secret only to find that as a result no one was interested in writing software; without software, there were few buyers.

A second area of disclosure is in software. No one is publishing the kernel of the operating system for second-generation machines, but the basic input/output system, or BIOS, should be published. The BIOS varies with each computer model even if the operating system type remains the same. Without the BIOS, it is very difficult for anyone except the manufacturer to add a different kind of disk drive or change the keyboard configuration. Even with the BIOS, only determined users will be able to make changes unless intelligible modification programs are available.

8-bit compatibility. Because the second-generation machines are new, software is still limited. To tap the major pool of 8-bit software, many machines can run CP/M-80, an 8-bit operating system, by including an 8-bit CPU. (Neither MS-DOS nor CP/M-86 will run CP/M-80 programs directly. There is a pure software emulator for CP/M-80 running under MS-DOS; initial reports say it is very slow.)

While CP/M-80 compatibility is a handy feature, few programs will run immediately. Most will require conversion from the old disk format to the new—a major chore for some formats—and then reinstallation for the characteristics of the new display and other input/output devices. There may be enough information with the hardware and software for the determined user; more often you will be at the mercy of either the software supplier or the hardware supplier, neither of whom may know anything about the other's product. Since programs are usually sold for a specific computer, the software vendors may balk at helping you run them on a second one. The CP/M-80 issue is a short term one since more powerful versions of the same programs designed for second-generation micros will take over soon.

Footprint. These computers take a precious resource—desktop space. The table gives the "footprint" in square inches for each computer. If the computer comes in pieces, you can leave just the keyboard on your desk. Wang has an elegant solution: Its central unit hangs off the side of a desk and an accessory adjustable arm holds the CRT in mid-air, freeing the desk top below. This arm is so handy that other companies will copy it.

The third generation. The second-generation micros will start to give way to the third around 1985. The third generation should overcome the slow computing speeds of the second, especially for updating the display. At least for business applications, hardware will then be sufficiently powerful that meaningful discussions will only be about software. Even larger RAM, perhaps up to a hundred megabytes or more and gigabyte optical disks will allow some truly incredible software. What will happen to the second-generation micros? They will still work, of course, but so much less efficiently than their replacements that they will fill our attics—and an occasional museum, next to the Pac-Man arcade game. □

Cary Lu is managing editor of High Technology.

MARKET OUTLOOK: 16-bit microcomputers

The 16-bit microcomputer is indeed a significant technological advance over its 8-bit predecessor, but the effects should extend far beyond technology. The market impact should be explosive.

The business sector of the microcomputer market is expected to quadruple to over $10 billion by 1986, from $2.5 billion this year. The home market should also grow fourfold, from $1 billion in 1982 to over $4 billion by 1986, bringing the total microcomputer market to some $14 billion. The number of 16-bit units sold will increase steadily during this period and account for 60–75 percent of the total by 1986, according to a Yankee Group study.

Priced between $3000 and $10,000 for a complete desktop unit, the 16-bit microcomputer will make it possible for every executive and secretary to have a powerful personal system and a data base, able to communicate with the central computer and other microprocessors in the company.

More than 40 U.S. and foreign firms are offering 16-bit systems, and their number is growing. Despite the difficulties some of them face, no one expects a shakeout among the major manufacturers in the near future. The large size and rapid growth of the market will support many players. Over 944,000 units, including some 16-bit systems, will be shipped to businesses in 1982. By 1986, the total should reach nearly 4 million units.

The 16-bit microcomputer fills a vacuum between the home computer selling below $3000 and the minicomputer above $10,000. Three groups of companies are rushing in to stake a claim. The first includes major computer manufacturers: IBM, DEC, and Wang. Home computer manufacturers are the second with Tandy and Apple the most prominent, though Apple will not be introducing a unit until late 1982 or 1983. The third category consists of smaller manufacturers of computers and suppliers of computer equipment, such as Corvus and Vector Graphic, who have expanded their product lines and developed microcomputers.

The 16-bit microcomputer should have a devastating effect on the word processor market since it can easily be expanded into an integrated workstation that includes word processing. "The word processing market will fall out of bed," says Kenneth Bosomworth of International Resource Development, Inc.

The minicomputer market also may be vulnerable to the 16-bit unit, according to many computer specialists. They note that the 16-bit unit's microprocessor and memory are powerful enough to take on many of the jobs handled by a mini.

As computers are distributed more widely through organizations, there will be a sharp increase in the number of nontechnical professionals using them. The average lay user cares little about the technical advantages of 16 versus 8 bits. He will buy hardware based on the software's ability to solve his particular problem.

Because little applications software now exists for 16-bit machines, a number of companies are hedging their bets by offering 16-bit machines with 8-bit capability. It is thought that 8-bit and 16-bit systems will coexist until 1984 when the majority of microcomputers sold will be 16-bit machines and extensive software will be available. The price differential between 8-bit and 16-bit units will shrink noticeably by then.

Software has always figured prominently in the sale of computer hardware, especially microcomputers. Tandy and Apple obtained their early lead and then expanded it by offering extensive software.

Software packages for personal computers cost much less than equivalents for traditional minicomputers and mainframes. This differential will increase as the microcomputer market grows because prices for the newer software packages will be based on projected heavy sales, thus spreading the development cost over a broader base. The trend is toward "portability," software designed to be run with minimum modification in different machines.

In addition, thousands of new small businesses will be established by entrepreneurs to prepare specialized applications programs and package them with a 16-bit microcomputer as a turnkey system. Doctors, lawyers, hospitals, and small retail businesses are among the many possible customers.

As the number of computers increases, and as market pressures move both the hardware and software toward standardization and lower costs, the merchandising and selling of microcomputers also will change. Retail stores will become the major battleground. It is difficult to determine the total number of computer retail stores in existence today. Computerland's nearly 300 outlets make it the largest independent computer retail store organization. Apple is sold through more than 1100 retail outlets, and Tandy through the chain of more than 6300 Radio Shack stores.

Now that IBM and DEC have entered this market, they too will operate according to its pressures. Because of the lower price of microcomputer systems, they have found that selling through salesmen direct to the end user is no longer feasible. Both manufacturers have set up their own stores, but even this may not be sufficient. Consequently, they are planning to sell their systems through the Computerland chain as well, and IBM will also use Sears.

Computer retailing will take on many characteristics of cutthroat supermarket merchandising. Shelf space will be the key to survival. In a computer store, as in a supermarket, if the product isn't displayed in a prominent spot it might as well not be there. Companies with clout will maneuver to get their products positioned up front and promoted by the store sales force. ***—I.G.***

TEXT SCREEN ROUTINES

by Roger Keating

ED. Roger uses many screen techniques for his war games. This is the third one in which he gives us some interesting ways to enhance our programs, and menus.
The machine language program can be used in your own programs, either in it's entirity, or as individual subroutines. The source code has been lightly commented, but it would be very educational to work out the exact operation. A Basic program has been added for demonstration.

```
 10  HIMEM: 37800
 20 D$ =  CHR$ (4)
 30  PRINT D$"BLOAD PROG,A$9400"
 40  TEXT : HOME :
 50  PRINT : PRINT "EXAMPLE OF
     ROUTINES"
 60  PRINT : PRINT "YOU MAY USE
     ANY OF THE FOLLOWING"
 70  PRINT : PRINT "+1 : SWITCH
     INVERSE -> NORMAL"
 80  PRINT "      & NORMAL ->
     INVERSE"
 90  PRINT : PRINT "+2 : REVERSE
     THE SCREEN"
 100  PRINT : PRINT "+4 : FLIP
     THE SCREEN"
 110  PRINT : PRINT "+8 : A
     DELAY"
 120  PRINT : PRINT "+16: CLEAR
     THE SCREEN"
 121  PRINT : PRINT ">32 : REDRAW
     THE SCREEN"
 125  VTAB 20: PRINT "INPUT A
    , NUMBER (1-31) OR 0 TO END "
 130  VTAB 22: INPUT A
 140  IF A = 0 THEN  END
 145  IF A > 32 THEN  HOME : GOTO
     40
 150 A =  INT (A): IF A < 1 OR A
     > 31 THEN 130
 155  REM PLACE COMMAND CODE INTO
     LOCATION $0 AND ENTER
     MACHINE CODE
 160  POKE 0,A: CALL 37888
 165  IF A > 15 THEN  VTAB 17:
     PRINT ">32 : REDRAW THE
     SCREEN"
 170  GOTO 130
```

```
*9400.951C

9400- 46 00 90 03 20 24 94 46
9408- 00 90 03 20 54 94 46 00
9410- 90 03 20 88 94 46 00 90
9418- 03 20 0E 95 46 00 90 03
9420- 20 C6 94 60 A9 17 85 05
9428- 20 C1 FB A0 27 B1 28 C9
9430- A0 F0 17 29 C0 F0 0D C9
9438- 40 F0 0F B1 28 29 3F 91
9440- 28 4C 4A 94 B1 28 09 80
9448- 91 28 88 10 E0 C6 05 A5
9450- 05 10 D5 60 A9 17 85 05
9458- 20 C1 FB A9 27 85 01 A9
9460- 00 85 02 A4 01 B1 28 48
9468- A4 02 B1 28 85 03 68 91
9470- 28 A4 01 A5 03 91 28 E6
9478- 02 C6 01 A5 01 C9 13 D0
9480- E2 C6 05 A5 05 10 D1 60
9488- A9 00 85 01 A9 17 85 02
9490- A9 27 85 04 A5 01 20 C1
9498- FB A4 04 B1 28 48 A5 02
94A0- 20 C1 FB A4 04 B1 28 85
94A8- 03 68 91 28 A5 01 20 C1
94B0- FB A4 04 A5 03 91 28 C6
94B8- 04 10 DE E6 01 C6 02 A5
94C0- 02 C9 0B D0 CB 60 A9 00
94C8- 85 03 A9 07 85 01 8D D9
94D0- 94 A9 04 8D DA 94 A9 A0
94D8- 8D 00 04 18 AD D9 94 65
94E0- 01 8D D9 94 90 0A EE DA
94E8- 94 AD DA 94 C9 08 B0 08
94F0- A9 10 20 A8 FC 4C D6 94
94F8- A5 03 C5 01 F0 0F E6 03
9500- A5 03 8D D9 94 A9 04 8D
9508- DA 94 4C D6 94 60 A9 50
9510- 85 03 A9 40 20 A8 FC C6
9518- 03 D0 F7 60 53
```

```
;TEXT SCREEN ROUTINES BY ROGER KEATING
;=====================================
;
;THESE ROUTINES CAN BE CALLED FROM BASIC BY USING
;POKE 0,X : CALL 37888 - WHERE 'X' IS MADE UP OF
;
;+1 : TO SWITCH NORMAL TO INVERSE & INVERSE TO NORMAL
;
;+2 : TO REVERSE THE SCREEN  LEFT TO RIGHT
;
;+4 : TO FLIP SCREEN UPSIDE DOWN
;
;+8 : TO DELAY ONE SECOND
;
;+16: TO CLEAR THE SCREEN IN A BIT PATTERN
;
;IF X=5 THEN THE SCREEN WILL BE SWITCHED FROM INVERSE
;TO NORMAL AND ALSO BE FLIPPED UPSIDE DOWN.
;
;THESE ROUTINES ARE PLACED AT THE TOP OF MEMORY SO
;HIMEM: NEEDS TO BE SET AT 37800 TO PROTECT THEM
```

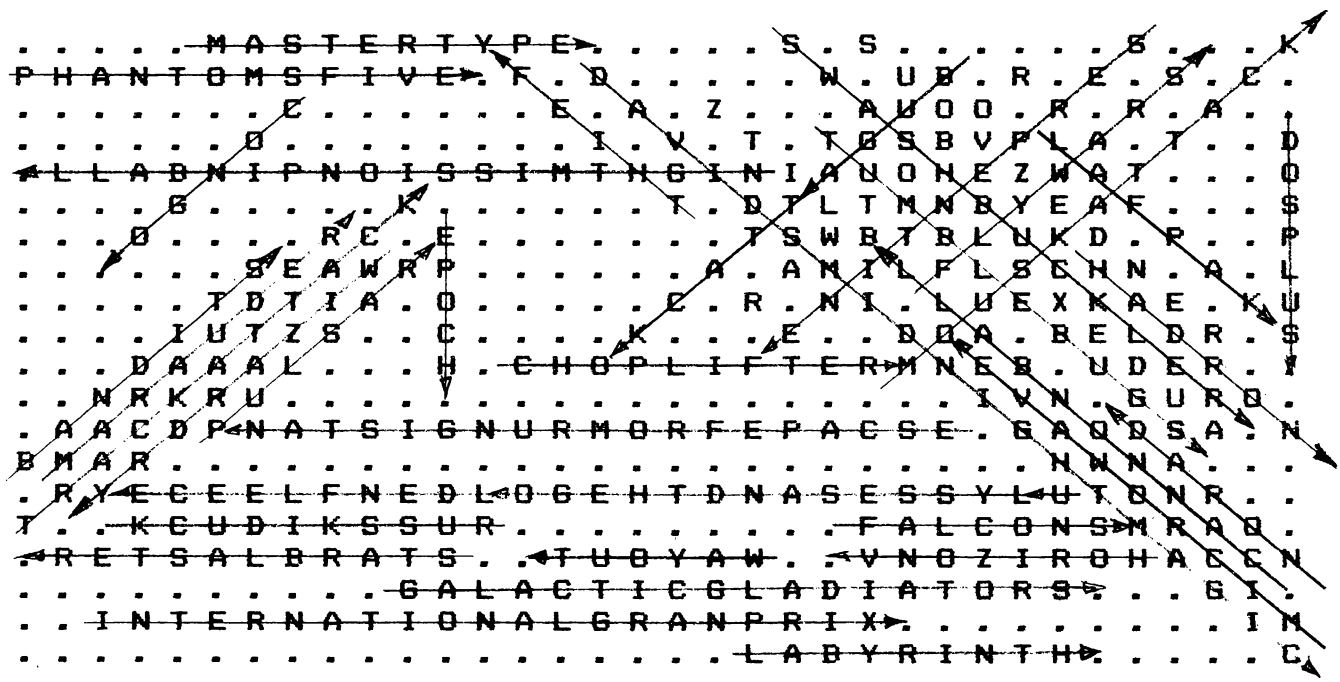
→

```
;
;IT IS ALSO POSSIBLE TO OPERATE THE ROUTINES FROM
MONITOR
;
;ANY COMMENTS, SUGGESTIONS OR IDEAS FOR FURTHER
;UTILITIES WOULD BE WELCOMED.
;
        ORG $9400
        OBJ $800
;
0000    DIRN    EPZ $00         ;LOCATION OF COMMAND
0001    CNT     EPZ DIRN+$1
0002    CNT1    EPZ CNT+$1
0003    SCR     EPZ CNT1+$1
0004    SAVY    EPZ SCR+$1
0005    LINE    EPZ SAVY+$1
;
0028    L       EPZ $28
0029    H       EPZ $29
;
;BCALC CALCULATES THE LINE ADDRESS AND PLACES IT IN L,H
;
FBC1    BCALC   EQU $FBC1
FCA8    DELAY   EQU $FCA8
;
;MENU TAKES THE VALUE FROM LOCATION $0 AND DETERMINES
;ACTION TO BE TAKEN
;
9400-   46 00      LSR   $00       MENU    LSR DIRN
9402-   90 03      BCC   $9407             BCC >2
9404-   20 24 94   JSR   $9424             JSR NORINV
9407-   46 00      LSR   $0        2       LSR DIRN
9409-   90 03      BCC   $940E             BCC >2
940B-   20 54 94   JSR   $9454             JSR REV
940E-   46 00      LSR   $00       2       LSR DIRN
9410-   90 03      BCC   $9415             BCC >2
9412-   20 88 94   JSR   $9488             JSR FLIP
9415-   46 00      LSR   $00       2       LSR DIRN
9417-   90 03      BCC   $941C             BCC >2
9419-   20 0E 95   JSR   $950E             JSR WAIT
941C-   46 00      LSR   $00       2       LSR DIRN
941E-   90 03      BCC   $9423             BCC >2
9420-   20 C6 94   JSR   $94C6             JSR CLR
9423-   60         RTS             2       RTS
;
; ROUTINE: NORMAL -> FLASH / FLASH -> NORMAL
;
9424-   A9 17      LDA   #$17      NORINV  LDA 17
9426-   85 05      STA   $05               STA LINE
9428-   20 C1 FB   JSR   $FBC1     0       JSR BCALC
942B-   A0 27      LDY   #$27              LDY 27
942D-   B1 28      LDA   ($28),Y   1       LDA (L),Y
;
; 0A0 IS A BLANK
;
942F-   C9 A0      CMP   #$A0              CMP 0A0
9431-   F0 17      BEQ   $944A             BEQ NEXT1
9433-   29 C0      AND   #$C0              AND 0C0
9435-   F0 0D      BEQ   $9444             BEQ I.N
;
; IS IT FLASHING? IF SO SKIP
;
9437-   C9 40      CMP   #$40              CMP 40
9439-   F0 0F      BEQ   $944A             BEQ NEXT1
;
; SWITCH NORMAL -> INVERSE
;
943B-   B1 28      LDA   ($28),Y           LDA (L),Y
943D-   29 3F      AND   #$3F              AND 3F
943F-   91 28      STA   ($28),Y           STA (L),Y
9441-   4C 4A 94   JMP   $944A             JMP NEXT1
;
; SWITCH INVERSE -> NORMAL
;
9444-   B1 28      LDA   ($28),Y   I.N     LDA (L).Y
9446-   09 80      ORA   #$80              ORA 80
9448-   91 28      STA   ($28),Y           STA (L),Y
;
944A-   88         DEY             NEXT1   DEY
944B-   10 E0      BPL   $942D             BPL <1
;
944D-   C6 05      DEC   $05               DEC LINE
944F-   A5 05      LDA   $05               LDA LINE
9451-   10 D5      BPL   $9428             BPL <0
9453-   60         RTS                     RTS
;
; ROUTINE: LEFT TO RIGHT
;
9454-   A9 17      LDA   #$17      REV     LDA 17
9456-   85 05      STA   $05               STA LINE
9458-   20 C1 FB   JSR   $FBC1     0       JSR BCALC
945B-   A9 27      LDA   #$27              LDA 27
945D-   85 01      STA   $01               STA CNT
945F-   A9 00      LDA   #$00              LDA 00
9461-   85 02      STA   $02               STA CNT1
;                                  1:
9463-   A4 01      LDY   $01               LDY CNT
9465-   B1 28      LDA   ($28),Y           LDA (L),Y
9467-   48         PHA                     PHA
9468-   A4 02      LDY   $02               LDY CNT1
946A-   B1 28      LDA   ($28),Y           LDA (L),Y
946C-   85 03      STA   $03               STA SCR
946E-   68         PLA                     PLA
946F-   91 28      STA   ($28),Y           STA (L),Y
9471-   A4 01      LDY   $01               LDY CNT
9473-   A5 03      LDA   $03               LDA SCR
9475-   91 28      STA   ($28),Y           STA (L),Y
9477-   E6 02      INC   $02               INC CNT1
9479-   C6 01      DEC   $01               DEC CNT
947B-   A5 01      LDA   $01               LDA CNT
947D-   C9 13      CMP   #$13              CMP 13
947F-   D0 E2      BNE   $9463             BNE <1
9481-   C6 05      DEC   $05               DEC LINE
9483-   A5 05      LDA   $05               LDA LINE
9485-   10 D1      BPL   $9458             BPL <0
9487-   60         RTS                     RTS
;
; ROUTINE: FLIP TOP TO BOTTOM
;
9488-   A9 00      LDA   #$00      FLIP    LDA 00
948A-   85 01      STA   $01               STA CNT
948C-   A9 17      LDA   #$17              LDA 17
948E-   85 02      STA   $02               STA CNT1
9490-   A9 27      LDA   #$27      0       LDA 27
9492-   85 04      STA   $04               STA SAVY
9494-   A5 01      LDA   $01               LDA CNT
9496-   20 C1 FB   JSR   $FBC1             JSR BCALC
9499-   A4 04      LDY   $04       1       LDY SAVY
```

```
949B-  B1 28     LDA  ($28),Y        LDA (L),Y
949D-  48        PHA                 PHA
949E-  A5 02     LDA  $02            LDA CNT1
94A0-  20 C1 FB  JSR  $FBC1          JSR BCALC
94A3-  A4 04     LDY  $04            LDY SAVY
94A5-  B1 28     LDA  ($28),Y        LDA (L),Y
94A7-  85 03     STA  $03            STA SCR
94A9-  68        PLA                 PLA
94AA-  91 28     STA  ($28),Y        STA (L),Y
94AC-  A5 01     LDA  $01            LDA CNT
94AE-  20 C1 FB  JSR  $FBC1          JSR BCALC
94B1-  A4 04     LDY  $04            LDY SAVY
94B3-  A5 03     LDA  $03            LDA SCR
94B5-  91 28     STA  ($28),Y        STA (L),Y
94B7-  C6 04     DEC  $04            DEC SAVY
94B9-  10 DE     BPL  $9499          BPL <1
94BB-  E6 01     INC  $01            INC CNT
94BD-  C6 02     DEC  $02            DEC CNT1
94BF-  A5 02     LDA  $02            LDA CNT1
94C1-  C9 0B     CMP  #$0B           CMP 0B
94C3-  D0 CB     BNE  $9490          BNE <0
94C5-  60        RTS                 RTS
;
94C6-  A9 00     LDA  #$00     CLR   LDA 00
94C8-  85 03     STA  $03            STA SCR
;
; ROUTINE: CLEAR SCREEN 'RANDOMLY'
;
;CNT=07 MEANS THAT EACH 7TH CHARACTER WILL BE CLEARED
;FROM THE SCREEN
;
94CA-  A9 07     LDA  #$07           LDA 07
94CC-  85 01     STA  $01            STA CNT
94CE-  8D D9 94  STA  $94D9          STA LOC+$1
94D1-  A9 04     LDA  #$04           LDA 04
94D3-  8D DA 94  STA  $94DA          STA LOC+$2
94D6-  A9 A0     LDA  #$A0     0     LDA A0
94D8-  8D 00 04  STA  $0400    LOC   STA $400
94DB-  18        CLC                 CLC
94DC-  AD D9 94  LDA  $94D9          LDA LOC+$1
94DF-  65 01     ADC  $01            ADC CNT
94E1-  8D D9 94  STA  $94D9          STA LOC+$1
94E4-  90 0A     BCC  $94F0          BCC >1
94E6-  EE DA 94  INC  $94DA          INC LOC+$2
94E9-  AD DA 94  LDA  $94DA          LDA LOC+$2
94EC-  C9 08     CMP  #$08           CMP 08
94EE-  B0 08     BCS  $94F8          BGE >2
94F0-  A9 10     LDA  #$10     1     LDA 10
94F2-  20 A8 FC  JSR  $FCA8          JSR DELAY
94F5-  4C D6 94  JMP  $94D6          JMP <0
94F8-  A5 03     LDA  $03      2     LDA SCR
94FA-  C5 01     CMP  $01            CMP CNT
94FC-  F0 0F     BEQ  $950D          BEQ CLRX

94FE-  E6 03     INC  $03            INC SCR
9500-  A5 03     LDA  $03            LDA SCR
9502-  8D D9 94  STA  $94D9          STA LOC+$1
9505-  A9 04     LDA  #$04           LDA 04
9507-  8D DA 94  STA  $94DA          STA LOC+$2
950A-  4C D6 94  JMP  $94D6          JMP <0
950D-  60        RTS           CLRX  RTS
;
; ROUTINE: DELAY
;
950E-  A9 50     LDA  #$50     WAIT  LDA 50
9510-  85 03     STA  $03            STA SCR
9512-  A9 40     LDA  #$40     1     LDA 40
9514-  20 A8 FC  JSR  $FCA8          JSR DELAY
9517-  C6 03     DEC  $03            DEC SCR
9519-  D0 F7     BNE  $9512          BNE <1
951B-  60        RTS                 RTS
951C-  00        BRK                 END
```

JANUARY/FEBRUARY PUZZLE SOLUTION:



SOFT STORY

by John Rotenstein

Review Software supplied by IMAGINEERING

FROGGER + FRAZZLE

BANK STREET WRITER

SPACE CADET + MARS CARS

FROGGER

Sierra On-Line
+SEGA

As the name suggests, this is an Apple implementation of the arcade game of the same name. For those unfamiliar with this game, and other FROGGER programs, here is the objective.

You control a frog who must find it's way home. By using joystick or keyboard, you must direct the frog through lanes of traffic, and then successfully navigate a river. This can be done by jumping on a turtle's back, jumping top logs, and taking rides on a crocodile's back. Of course, there are dangers involved in this journey.

This version is by Olaf Lubeck, maker of many other On-Line games. The graphics are better than his usual style, and there is music interlaced in the game, which greatly helps.

This is a good game for those who like the original, and is greatly improved by the "SPIRA DISK" loading system which dramatically increases loading time.

FRAZZLE

Muse

This is one of the latest Muse games, and one of a new line that is not written by Silas Warner.

The game, briefly, is that you are faced wit the job of eliminating six "BEASTIES" in each level. This is done by moving your Frazzle Force Ship around the screen and dropping energy probes. On contact with these probes, the beasties die. As the levels increase, it becomes harder to eliminate all the beasties.

Although the game does lack something to be desired, I was greatly impressed by the new Muse Unlimited Disk Policy, which allows unlimited replacement of a blown disk.

BANK STREET WRITER

Broderbund

This program is described by the makers as a Home Word Processor. This is a good summary, as it is a word processor, yet it is not of the necessary quality for large, business use.

It is run off a menu-type system. This means that instead of a single keypress, as in other processors, you must move through a menu to obtain features such as erasing large portions of text.

The text is displayed in high-res, much like Zardax in forty column. Capitals are signalled by either one or two SHIFT-N symbols (?. When the display is filled, it quickly jumps to re-display the text. The text is automatically taken to a new line if it exceeds the screen length.

Due to certain features, it is not as quick as other processors, but is very good as an introduction for those who have not used word processors before.

As an added help, the reverse side of the disk has a tutorial. This teaches the user in five step-by-step lessons how to use the program. This tutorial takes away the need to read the manual

This is certainly a good, cheaper way to start using word processors, and is improved by the fact that it comes with a backup copy.

→

SPACE KADET

DATAMOST, Inc

Dan Illowsky, author of SNACK ATTACK and COUNTY FAIR, has written this battle simulator of the Space Academy.

The object is to travel through a block-like area, leaving protective force-sheilds behind. You must destroy alien ships which also travel the area, and build up many shields.

The graphics of this game are nothing fantastic at all, and quite disappointing for Dan Illowsky. One or two players may play from the keyboard.

UNFORTUNATELY, the set keyboard controls are as good as impossible to master. FORTUNATELY, an option is available to set strating level and to make new keyboard controls. UNFORTUNATELY, the option does not avail itself when the correct control character is used. In fact, it seems as if it is only in the instructions, and not in the program itself!

Not only that, but the instructions have an errata explaining a change in the keyboard controls.

This game has no ultimate object, poor controls, and is most definately only a game for who are totally desperate for something to play.

MARS CARS

DATAMOST Inc.

In this new game, you travel to Mars, and fight to obtain a fortune in treasures.

You control a car-like figure, which you move around the screen. There are hundreds of barriers which you can break through, and many MARS CARS which kill on contact. You have no weapons, but use intelligence to out maneuver them.

On each frame are four jewels which must take, and then proceed onto the warp gate. Each frame finished gives an extra man. There are sixteen different levels, each different.

This is not a bad game, and is a change from a normal SHOOT-THE-ALIEN game.

INTERPLANETARY APPLE

J. Rotenstein

We all know that many people are writing programs for the APPLE. Now, however, there is "BEZARUIAS" (translated from a foreign language).

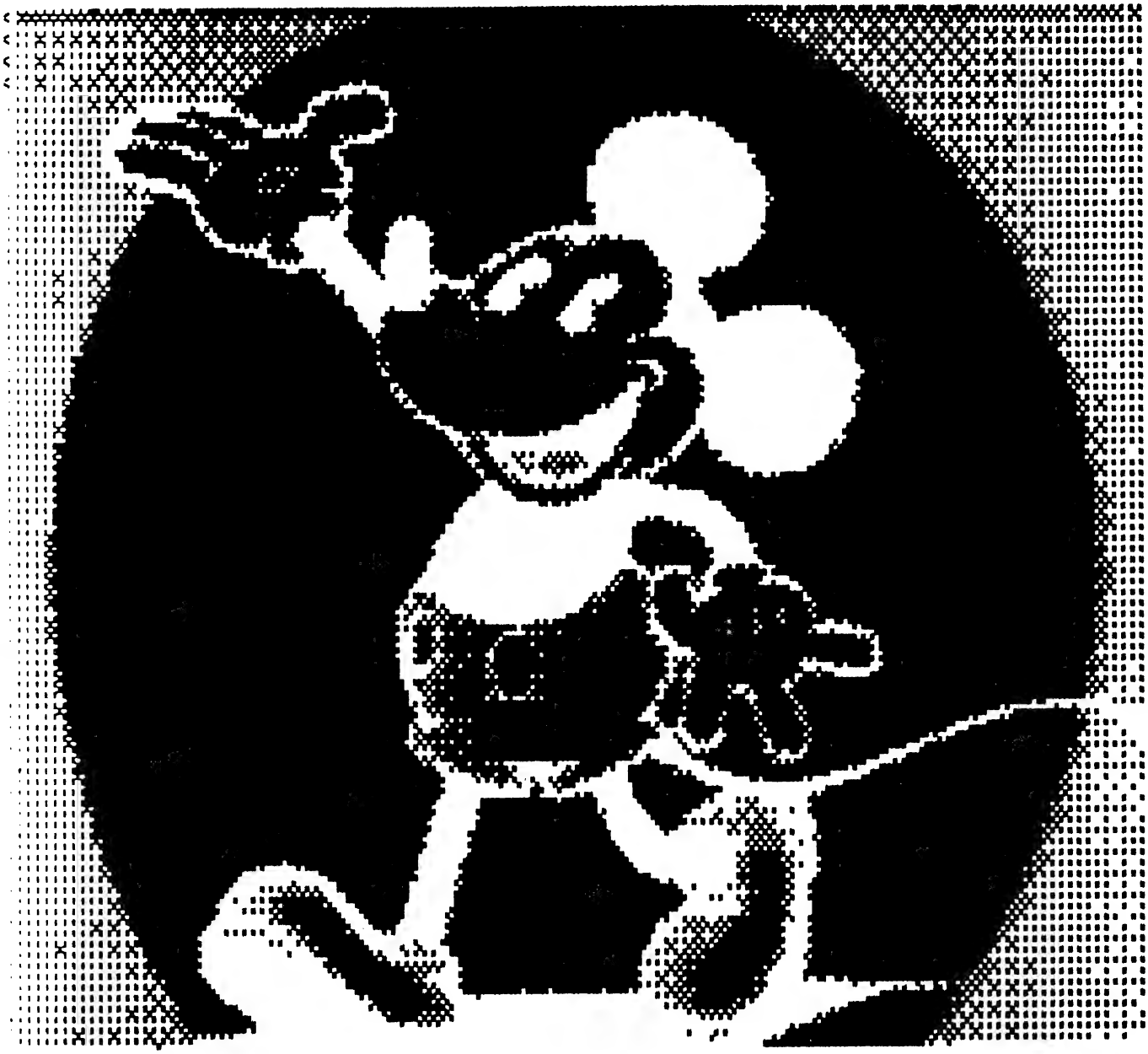
This leading game author has produced "the hottest item in the arcades throughout the galaxy". This game is called "BEZARE" (again translated). Although it is not currently in Australia (and I have not yet seen it) it is apparently a chronicle of the alien's attempts to explore the planet Earth.

You are on the side of the aliens, and you must fight primitive devices and semi-intelligent life forms (Earthers).

If that isn't enough, there is another twist to the plot. Since the game is from an alien, the game manual and screen instructions are all in a different script. To succesfully play the game, you must be able to decipher the alien writing.

Many of you may have seen ads from Southwestern Data Systems and "BEZCO" (yes, translated again!) in the SOFTALK magazine. The major difference between the ads is the language. There is, however, enough information to decipher the script from the two ads. This could come in handy for the competition in the October SOFTALK which requires you to decipher the script.

So, if you see an APPLE orientated alien walking down the street, ask him to play "BEZARE".



EDITORIAL

Many thanks for the articles which have been coming in. I am sorry if I cannot place your piece immediately the next month, mostly that has already been allocated. So don't dispair Ian Armstong and Brian Walsh.

At the last meeting, it was proposed to give awards for interesting contributions. To do so we rely on your comments. Please let us have them on paper.

I hope you like the article 'Microcomputers the second wave'. I had started to write a similar one when I found it. We decided to buy it's copyright and print it instead. I hope you find it as informative as I did.

Lisa, Apple's new baby is in the news. Next month I will print a summary of it, showing many of it's remarkable possibilities, as well as comments by Ron Lombardo, who was at the unveiling with me.

Q&A has been started by Ken Ozanne. Whilst we can seed it with questions, it is infinitely better to send your own questions in to the club.

Many members have suggested a change of title page for the magazine, however this would depend entirely on picture contributions. So keep your pictures rolling in, on disk preferably.

SAVING ARRAYS ON DISK WITH PASCAL

Ron Haines

Most programs that store data in arrays need to write and read these arrays to and from disk. There are at least three ways of doing this, one of which is obvious, the other two are less so. To compare the methods we need a prototype array structure which is defined below.

```
CONST BUFFSIZE=511;

TYPE BUFFER=PACKED ARRAY[0..BUFFSIZE] OF 0..255;

VAR NUMBERS1,NUMBERS2:BUFFER;
```

This gives us two arrays, each being 512 bytes long. In comparing the three methods of storing these arrays on disk the time taken to write the data to disk and the length of the resulting file will be considered.

(1) Use WRITE or WRITELN.
In this case we must store the arrays in TEXT files and set up a loop to output the arrays one element at a time.

```
VAR I:0..BUFFSIZE;
    OUTFILE:TEXT;

BEGIN
  REWRITE(OUTFILE,'JUNK.TEXT');
  FOR I:=0 TO BUFFSIZE DO
    WRITELN(OUTFILE,NUMBERS1[I]);
 FOR I:=0 TO BUFFSIZE DO
    WRITELN(OUTFILE,NUMBERS2[I]);
 CLOSE(OUTFILE,LOCK);
END.
```

With this method, JUNK.TEXT becomes a 10-block file and the program takes 65 seconds to write the data.

(2) Use BLOCKWRITE.
BLOCKWRITE works with untyped files and allows us to save a whole array with one statement (provided we know how long the array is).

```
VAR NBLOCK:INTEGER;
    OUTFILE:FILE;

BEGIN
  REWRITE(OUTFILE,'JUNK');
  NBLOCK:=BLOCKWRITE(OUTFILE,NUMBERS1,1);
  NBLOCK:=BLOCKWRITE(OUTFILE,NUMBERS2,1);
  CLOSE(OUTFILE,LOCK);
END.
```

The disadvantage of using BLOCKWRITE is that we are forced to write whole disk blocks (512 bytes). BLOCKWRITE becomes tricky to use with data structures that are not multiples of 512 bytes in size. It is, however, much faster than WRITELN. The example takes 3 seconds to write the two arrays to disk and the resulting file is 2 blocks long.

→

(3) Use Typed Files.
This involves declaring a file to be a FILE OF (type):

```
VAR OUTFILE:FILE OF BUFFER;

BEGIN
  REWRITE(OUTFILE,'JUNK');
  OUTFILE^:=NUMBERS1;
  PUT(OUTFILE);
  OUTFILE^:=NUMBERS2;
  PUT(OUTFILE);
  CLOSE(OUTFILE,LOCK)
END.
```

The performance of this method is virtually identical to that of method (2) (time to write arrays to disk: 3 seconds, file size: 2 blocks). The distinct advantage of this method over the use of BLOCKWRITE is that the former conforms to standard Pascal (Jensen and Wirth) whereas BLOCKWRITE does not exist in standard Pascal.

To read the data files it is necessary to replace the output statements with the appropriate input statements and the REWRITE's with RESET's. Doing this for method (1) reveals an unexpected bug in the Pascal compiler. Simply setting up a loop around a READLN(OUTFILE1,NUMBERS1[I]) doesn't work. The compiler objects that NUMBERS[I] is not of the appropriate type for the READLN. If the arrays are not defined as PACKED everything goes smoothly. The solution is to read each element into an INTEGER variable, then assign the value to the PACKED ARRAY element. Reading data with method (2) simply requires the exchanging of the BLOCKWRITE's for BLOCKREAD's. Method (3) reads data with the following sequence:

```
RESET(OUTFILE,'JUNK');
NUMBERS1:=OUTFILE^;
GET(OUTFILE);
NUMBERS2:=OUTFILE^;
```

For reading data, method (1) is again the slowest (50 seconds to read both arrays) while the other two are very fast (2 seconds).

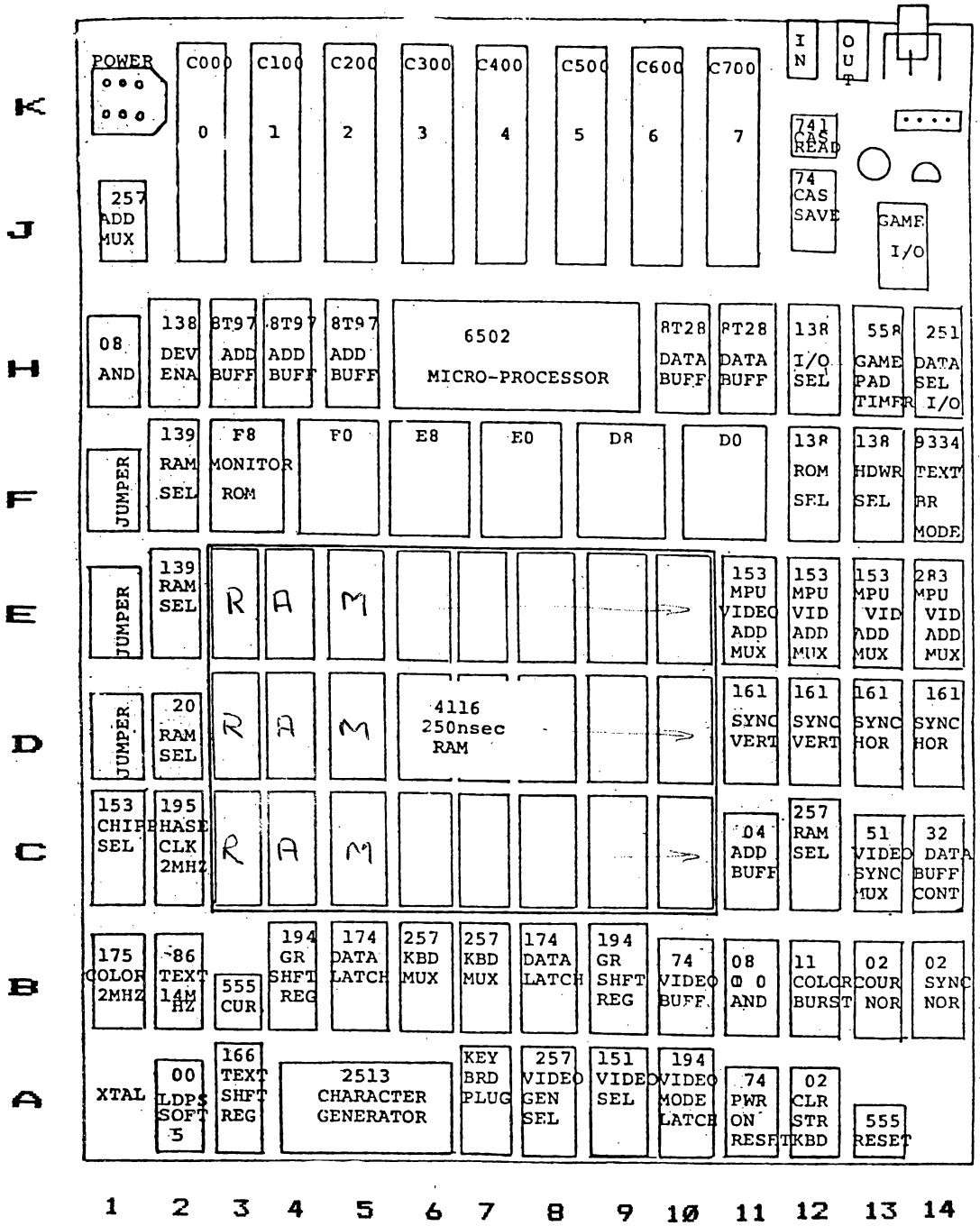
Clearly the first of the three methods is inferior in terms of execution speed and use of disk space. Yet the reason for these inefficiencies gives the method one great advantage. WRITELN converts the data to ASCII characters so that the file produced can be inspected with the editor or transferred to the CONSOLE: or PRINTER: with sensible results. In debugging a program this can be an essential aid. The other two methods save the information as a memory image i.e. a byte by byte copy of the data as it is stored in memory. Transferring these files to the PRINTER: may give rise to distinctly unpleasant results.

FUTURE MEETINGS:

APC SHOW: MARCH 10-11-12th.

MARCH: 14th. APRIL: 11th.

APPLE II CHIP MAP



TROUBLE SHOOTING FOR APPLE II SYSTEMS

Thanks to Washington Apple Pi, and others.

WARNING: YOUR APPLE IS AN EXPENSIVE ITEM TO LEARN REPAIRING ON
If in doubt, send it to an Apple repair centre.

SOME PRELIMINARY MAINTENANCE:

1. Brush dirt out of keyboard, and inside the case.
2. Check the mains plug on both ends.
3. Pull boards out of the sockets, and clean pins with metho.
   Take care not to press hard on the motherboard.
4. See if all the chips are seated properly, some RAM chips fit badly.
5. Clean disk drive.
6. Buy a good Test program (Applecilin,Brain Surgeon,etc.)

ALWAYS MAKE SURE THE POWER IS OFF!

FAILURE:	PROBABLE CAUSE:
Dead Apple (Power light off)	Loose plug,Faulty switch,Power Supply.
Dead Apple (Power light on)	Replace the following ICs; B2-74S86 B1-74S175 C2-74S195 A2-74LS00 C1-74S153 B1374LS02
No RESET or No Response	Replace the following ICs; RAM Rows C,D and E - ROM Rows F3-F11 F12-74LS138 H1-74LS257 B5-B8-74LS174 B6-74LS257 B7-74LS257 B11-74LS08 H3-H4-H5-8T97 H14-74LS251 H10-H11-8T28 H8-6502 C14-74LS32 E11-E12-E13-74LS153
No Video (Speaker does beep)	Replace the following ICs; C2-74LS195 B13-74LS02 A2-74LS00 C11-74LS04 D11-D12-D13-D14-74LS161 B10-74LS74 A9-74LS151 A10-74LS194 A8-74LS257 B2-74S86
No Text Mode	Replace the following ICs; A9-74LS151 B2-74LS86 A3-74LS166 A5-2513 A10-74LS194 A8-74LS257 F14-9334 F13-74LS138
Hires or Lores problems	Replace the following ICs; F14-9334 A9-74LS151 A10-B4-B9-74LS194 A8-J1-74LS257 A11-B10-74LS74 C11-74LS04 C12-74LS257 H1-74LS08
RAM problems	Replace the following ICs; System RAM rows C,D, and E E11-E12-E13-74LS153 E2-F2-74LS139 A2-74LS00 B5-B8-74LS174 C14-74LS32 D2-74LS20 H1-74LS08
ROM problems	Replace the following ICs; System ROM F3-F11 F12-74LS138 H1-74LS08
Vertical or Horizontal Sync. problems	Replace the following ICs; C13-74LS51 C14-74LS32 B11-74LS08 A2-74LS00 A12-B14-74LS02 B13-74LS02 C11-74LS04 D11-D12-D14-74LS161
Game Paddles problems	Replace the following ICs; H13-74LS558 H14-74LS251 F13-74LS138
Cassette Loading problems	Replace the following ICs; K12-741 OP AMP, H14-74LS251 F13-74LS138
Cassette Saving problems	Replace the following ICs; K13-74LS74 F13-74LS138
Speaker problems	Replace the following ICs; K13-74LS74 F13-74LS138
Keyboard problems	Replace the following ICs; B6-B7-74LS257 B10-74LS74 A12-74LS02 C11-74LS04 F13-74LS138
Peripheral Card in slot wont work	Replace the following ICs; H2-H12-74LS138

QUESTIONS and ANSWERS

Answers by Ken Ozanne

This column is the first fruits of my recent letter to Hans. I will endeavour to answer any questions sent to me, or to the magazine (though I hope others who get questions will publish answers in this column as well). If you send questions, please say whether you want your name published - I don't want to embarrass anyone. It is quite in order to ask for clarification of an answer already given. Please make your questions as specific as possible.

1. What are text files?

Text files are files stored in ASCII character code, rather than the various other forms available on the Apple (Integer, Applesoft or Binary). This is really simpler, though it may not at first seem to be. There are two kinds, Random access and Sequential text files (see the DOS Manual chapters 6 to 8 for more information). Sequential text files are the easier ones to use for beginners, so I will discuss them only from now on.

2.What are they used for?

Textfiles are used for all kinds of things - for example, most word processors, including the one with whose aid Applecations is written, store text as sequential textfiles. It would be usual to store information for a data base system on random access textfiles. If I want the computer to run a whole bunch of programs one after the other I can set up a sequential textfile to supervise it all and go fishing for the afternoon. These are just examples - use of textfiles is an integral part of using your Apple.

3. How are textfiles created?

Here is a little program that will write a textfile containing the program itself:

```
10  D$=CHR$(4)
20  PRINT D$"OPEN TEXT CAPTURED"
30  PRINT D$"WRITE TEXT CAPTURED"
40  LIST 10,90
50  PRINT D$"CLOSE TEXT CAPTURED"
90  END
```

The D$, OPEN, WRITE and CLOSE keywords are the vital bits. D$ is used to indicate that a DOS command is coming up within a program. OPEN opens a file. WRITE prepares it for writing. CLOSE ends off and returns output to the screen. (Output goes to the file between WRITE and CLOSE.)

4. How are textfiles accessed.

You OPEN the file as above and READ it instead of WRITEing to it. Don't forget to CLOSE it afterwards or the computer won't respond to the keyboard!

There is a good textfile reader on A.U.G. DISK 14 (it reads lower case sensibly even if you lack a lower case chip). This is a good program to study for advanced Apple programming techniques, but don't expect to understand it all the first time through!

5. I ran the following program:

```
10 T = 0
20 T = T + 0.2
30 PRINT T
40 IF T<12 THEN 20
50 END
```

all went well until 6.2 but then it printed 6.39999999 and produced strange results up to 9.99999998. What is happening?

This is a standard problem with all binary computers. The numbers are stored internally in binary form and .2 cannot be expressed exactly in binary form.
Eventually the small error shows up in your printout. There are ways around such problems, though they are not negligible and may become very important in large scientific problems.
You may find it enough to write:

→

```
25 T=INT(10*T+0.5)
26 T=T/10
```

these two lines will round off T to one decimal place and keep the unwanted .9999999s out of sight. You can replace the 10 with 100 or 1000 for two or three decimals and so on up to about eight decimals (perhaps fewer) when you start running out of accuracy.

(That too can be fixed but not so simply.) For more advanced users - the 6502 chip in the Apple has a BCD mode (it doesn't have to be binary) and exact decimal arithmetic is possible. But you must be able to program in machine/assembler code to take advantage of this.

The Hanging Apple Mystery

by Ken Ozanne

A couple of months ago, Ferg Brand approached me with the following problem:

If you BOOT your Apple, CALL -151 and then immediately issue the monitor command A000<1000.1FFFM (move the contents of memory locations 1000 to 1FFF to locations A000 to AFFF) then the Apple hangs and needs to be RESET before you can regain control. If you try the same monitor command after you have been working for a little while it works fine. (This statement was misleading, as will appear.)

This was intriguing and my first move was to check that the same symptoms did appear on my own Apple. (You may care to test the phenomenon before reading on.) Of course they did and it was up to me to track down the cause. Actually it was clear that things had broken down at A5B2, but that didn't help much (it is the place in DOS where the current BASIC is established and, in hindsight, is reached purely because of the RESET and the remaining rump of DOS).

I guessed immediately that this was a Page Zero problem and began by dumping Page Zero of memory in Hex before and after the hanging. This showed around 25-30 bytes altered, of which my attention soon focused on bytes 36-39 (hex), which read BD 9E 81 9E originally and F0 FD 1B FD finally. (I did manage to get an intermediate state to confuse things, but I don't intend to discuss that.)

These bytes are output (36-37) and input (38-39) handler routine addresses and are the locations commonly known as the DOS "hooks".

It is obvious that the original move instruction wipes out much of DOS (DOS normally uses 9600 to BFFF and the move clobbered A000 to AFFF or almost half of DOS). Clearly then, a successful move wiped out the very routines that were supposed to handle screen I/O! Small wonder then that the Apple hung.

And the reason that RESET "fixed" things was that RESET, in a non-DOS environment (which we effectively had by chopping the heart out of it!), sets these locations to F0 FD 1B FD, which are the standard I/O handlers for an Apple without DOS. In that environment there is nothing special about locations A000 to AFFF and we may overwrite them with impunity. Of course the chances of any DOS command working at that stage must have been fairly minimal.

AUG SOFTWARE LIBRARY LISTING

AUG DISK # 31
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A 009 AUG DISK # 31+
A 024 LOGO
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A 004 ADVENTURE #9
A 062 CLONE MASTER
A 007 ASSAULT ON THE CLONE MASTER
T 014 EAMON.ARTIFACTS
T 101 EAMON.DESC
T 009 EAMON.DIRECTIONS
T 023 EAMON.MONSTERS
T 002 EAMON.NAME
T 009 EAMON.ROOM NAMES
T 009 EAMON.ROOMS
A 010 NOTES (PLEASE RUN)
I 020 BATTLESTAR
I 033 DRAGON MAZE 3
A 034 FIZZ BIN
A 048 GOLF III
A 008 MASTERMIND
I 007 MAZE GENERATOR
I 013 MAZE RACE TIMED
A 020 NAME THAT DATE
A 012 TIC TAC TOE

side 2

A 008 AUG DISK # 31-
A 024 LOGO
A 011 MENU
A 004 INFORMATION
A 032 NOTES (PLEASE RUN)
A 002 ALPHA70/DEMO
B 007 ALPHA70
T 006 ALPHA70/DESCRIPTION
A 010 ANYTEXT70
B 003 AT70/BIN
A 008 ANYTEXT
B 003 AT/BIN
A 003 BASE CONVERSION CHART I
A 003 BASE CONVERSION CHART II
A 005 BASE CONVERT JENKINS
A 007 BASE CONVERT MASSIMO
A 006 BASE CONVERT ##
A 007 BINARY TO FP
A 004 BLACKBODY
A 002 CAPTURE A PROGRAM
A 005 CATALOG PRINTER
A 003 CLEAR MEMORY
A 009 COMPOUND INTEREST TABLES
A 007 COMPRESSION RATIO
A 005 CYCLOID
A 003 DUMP ASCII MEMORY
A 002 ERASE HIRES SCREEN
A 003 FIBONACCI NUMBERS
A 011 FORMAT #
A 012 FUNCTION PLOTTER I
A 005 FUNCTION PLOT IA
A 006 FUNCTION PLOT II
A 012 GAMBLERS RUIN
A 006 GHOST STORY
A 005 HISTOGRAM
A 008 HYPERBOLA
A 006 KEYSPEAK DEMO
B 004 KS/BIN
B 052 KS/COUNT
A 008 KEYSPEAK ARITHMETIC
A 012 MAKE KEYSPEAK
A 006 RECORD SOUNDS
B 004 RS/BIN
T 008 RS KS/DESCRIPTION
A 006 LISSAJOUX
A 013 MATRICES
A 005 METRIC KELVIN TEMP
A 004 METRIC PETROL PRICE
A 007 METRIC TEMPERATURE
A 011 ROBOT MOTOR DESIGN
A 005 ROSETTE
A 014 SIMULTANEOUS EQN AND MATRIX
A 023 SPIRAL2
B 003 STEP & TRACE
A 004 ST/INSTRUCTIONS
I 002 TITLE CENTERING ROUTINE
A 002 TRY THIS
A 006 TRY THIS 1
B 002 TT1/BIN
A 004 TRY THIS 2
T 002 CALL -151
A 005 TRY THIS 3
A 007 TRY THIS 4
A 007 TRY THIS 5
I 003 TYPING VERTICAL

Brief notes for programs on disk # 31

side 1

1: This is Eamon adventure # 9, The Clone Master. Note that disk # 19, Eamon Master, is required to run this program.
2: BATTLESTAR is a lores game using paddle 0 to guide your Battlestar against the might of the Empire.
3: DRAGON MAZE 3 is a good maze game, where the maze is hidden after generation, and gradually re-appears as you collide with it. You have opposition in the maze, of course!
4: FIZZ BIN is a very absorbing card game for four players, three of the hands being played by the computer. Good text display of cards.
5: GOLF III is a well-presented game using lores colour displays for the various holes. Note that angles are measured clockwise from the top of the screen.
6: MASTERMIND is another of the "colour-in-sequence" guessing games. Enter colours as five consecutive letters, then press <CR>. The number of markers on the right of the screen gives the correct entries. A white marker means a colour is correctly placed. Get all five white to win!
7: MAZE GENERATOR will generate a random maze for you to solve. To get a hard copy, type <PR#1> and <CR> before running the program.
8: MAZE RACE TIMED is a lores maze game with four levels of skill.
9: NAME THAT DATE is an educational game, where one also learns about American history.
10: TIC TAC TOE is a good lores version of the game of "Noughts and Crosses", played against the computer.

side 2

1: ALPHA70/DEMO is the easy way to start ALPHA70, which is a 70 column facility, using hires screen 1. Read ALPHA70/DESCRIPTION for details.
2: ANYTEXT70 is a routine to read text files, or Applesoft and binary files as if they were text files. Uses ALPHA70 to display in 70 columns, with upper and lower case. Also uses AT70/BIN.
3: ANYTEXT is a 40 column version of the above program. Uses AT/BIN.
4: BASE CONVERSION CHART I displays hex codes $00 to $FF, with their decimal equivalents.
5: BASE CONVERSION CHART II displays decimal, hex and ascii codes from $00 to $FF. →

6: BASE CONVERT JENKINS converts between decimal and binary numbers.

7: BASE CONVERT MASSIMO converts between decimal and hex numbers.

8: BASE CONVERT ## converts between hex, decimal and binary numbers.

9: BINARY TO FP provides a conversion of a binary file to Applesoft data statements, to add to an Applesoft program. "Loadname" is the name of the binary file to be converted. The start address and length can be in decimal or hex, but precede hex by "$".

10: BLACKBODY Given the temperature and wavelength range, the program computes the power radiation and peak wavelength.

11: CAPTURE A PROGRAM is a routine to save an Applesoft program as a text file.

12: CATALOG PRINTER will output disk catalogs to a printer in slot #1. Provision is included to head each listing with a disk number.

13: CLEAR MEMORY is a clever little program, which clears more memory than is apparent from the listing. It even clears itself.

14: COMPOUND INTEREST TABLES computes six functions relating to interest, accumulation and mortgage problems.

15: COMPRESSION RATIO computes the compression ratio for a given cylinder design. Parameter ranges are given, but these have to be exceeded for an acceptable result.

16: CYCLOID plots, in hires, the path of a point of a circle rolling around another fixed circle.

17: DUMP ASCII MEMORY will list memory in ascii format on the screen, in twenty character lines.

18: ERASE HIRES SCREEN is a simple routine to add to an Applesoft program, to clear the hires screen after use.

19: FIBONACCI NUMBERS generates those numbers in the series which fall within the range 0 to 1,000,000,000.

20: FORMAT $ is a well-documented program showing a method of formatting real number outputs.

21: FUNCTION PLOTTER I will plot a function, entered into line 250, on the hires screen.

22: FUNCTION PLOT IA plots a number of functions on the text screen, hence easy printouts can be obtained.

23: FUNCTION PLOT II uses the lores screen to plot a function entered into line 5 of the program.

24: GAMBLERS RUIN is a demonstration of how a gambler always loses in the long term. Uses hires display.

25: GHOST STORY demonstrates the overlaying of text and hires screens.

26: HISTOGRAM generates histograms in horizontal format, for data entered into DATA statements. Uses auto-scaling.

27: HYPERBOLA Given enough data, the program computes the centre location, axis coordinates, foci and asymptotes.

28: KEYSPEAK DEMO demonstrates the transferring of audio signals from tape into the Apple. The program provides audible response to number keys. Uses KS/BIN and KS/COUNT. KEYSPEAK ARITHMETIC is a demo of simple arithmetic routines. MAKE KEYSPEAK, RECORD SOUNDS and RS/BIN are files for generating the sound library. RS KS/DESCRIPTION gives details of the programs.

29: LISSAJOUX displays lissajoux patterns on the hires screen, for selected ratios of "A" and "B". ⟶

30: MATRICES computes the product of two matrices, or the inverse of a matrix, showing the steps involved in each case.

31: METRIC KELVIN TEMP gives conversions between Fahrenheit, Centigrade, and Kelvin temperatures.

32: METRIC PETROL PRICE will print out a list of petrol costs in cents/litre and cents/imperial gallon, in steps of 0.1 cents/litre, from 33.5 cents/litre to your selected cut-off point.

33: METRIC TEMPERATURE is similar to program 31:, but does not give Kelvin temperatures.

34: ROBOT MOTOR DESIGN Given enough data, the program computes the design parameters of a robot drive motor.

35: ROSETTE is similar to "Cycloid", but plots a selected size of rosette.

36: SIMULTANEOUS EQN AND MATRIX solves quadratic and simultaneous equations, matrix addition and subtraction, and scalar and matrix multiplication.

37: SPIRAL2 generates different forms of spirals on the hires screen.

38: STEP & TRACE gives the ability to use the old monitor rom routines, to Autostart rom users. Read ST/INSTRUCTIONS for details.

39: TITLE CENTERING ROUTINE shows a way to centre text in an Integer program.

40: TRY THIS prevents listing a program. The "list" command causes a "run" instead.

41: TRY THIS 1 allows one to call machine language routines from Applesoft, and pass parameters to it. Uses TT1/BIN.

42: TRY THIS 2 allows the full use of DOS commands whilst in the monitor. Uses CALL -151.

43: TRY THIS 3 shows how to enter a machine language routine into an Applesoft REM statement.

44: TRY THIS 4 gives advice on ways to load two binary files, and then run one of them.

45: TRY THIS 5 shows how to move memory blocks when the ranges overlap, and gives a subtle way to clear memory.

46: TYPING VERTICAL is a simple demo of vertical printing to the screen.

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ADVENTURERS' CORNER

—With Ed Mehrtens

Ultima by California Pacific is a very large program, so don't expect to finish it in one session . The game ranges from approximately 9000 BC to the future with three scenarios ; the far past, a medieval period and a space war in the future, and you need to gain expertise in all these time zones.

Basically the aim of the adventure is to go backwards in time, about 10000 years, and kill an evil wizard before he can develop a magical gem which will protect him against all attacks. To do this you must overcome numerous obstacles and develop a character to the stage where he, or she, can hope to survive a battle with the wizard.

To begin you decide what race your character is to be Human, Elf, Hobbit or Dwarf. Then the type or profession of your character Fighter, Cleric, Wizard or Thief. Each race and type has advantages and disadvantages, with differing strength, agility, stamina, charisma, wisdom, intelligence and hit points. It is a game which should never become boring, as if you succeed with one character, there is still 15 more possibilities to try.

The only way to increase hit points and experience, is to enter the various dungeons, kill the monsters and escape back to the surface. When your hit points reach zero, your character is dead but will be resurecte^ with penalties as listed elsewhere. Hit points are lost when a monster successfully lands a blow in combat.

During the game you can enter various towns and castles. From the towns you can purchase various items which vary from town to town, and get information from talkative bartenders. From the castles, each of which has a King, you will need to obtain special jewels, by performing quests for the kings.

This is an excellent game and well worth buying, if you are at all interested in Dungeons and Dragons.

SOME CLUES to get you started;

(1) Performing quests for the four kings is essential, this is the only way to obtain four magical gems.

(2) Save the game frequently, to avoid being killed (the disk is only updated to the last saved game). If you are killed, you will be resurrected but with the following disadvantages.
 (a) Hit points are reset to the initial value.
 (b) You only have 19 days rations.
 (c) You lose all experience, weapons and gold.
 (d) Wisdom appears to be diminished.
 (e) Resurrection can occur anywhere, even on water where you can not move.

(3) All weapons, armour and spells must be readied prior to use.

(4) Experience is gained by all sucessfu^battles where you kill the monster.

(5) Hit points, however can only be increased by entering the various dungeons, killing the monsters and returning to the surface. If you have the following hit points (HP) then only attempt the following dungeon levels.
 0-100 HP Levels 1 to 2
 100-500 HP Levels 3 to 4
 500-1000 HP Levels 5 to 6
 1000-5000 HP Levels 7 to 8
 5000+ HP Levels 9 and 10
The best weapon against monsters appears to be a phasor.

(6) In the dungeons inspect for traps which will drop you to lower levels.

(7) For level 3 and beyond, buy plenty of 'Ladder Up' spells, as gelatinous cubes

→

will dissolve armour and your character will be unprotected. When this happens head for the surface fast (using ladder up spells) and ready new armour then re-enter the dungeon. You can not ready armour in the dungeon.

(8) It is possible to carry a great amount of possessions so carry extra weapons and armour on your campaigns.

(9) Thieves in the dungeons are extremely adept and will steal various items from you, even if you subsequently kill the thief you will not regain the stolen items.

(1Ø) If you see a monster in the distance and it does not advance towards you, check the floor for hidden trapdoors.

(11) If you are attacked from many directions at once, find a direction without a monster, go that way, turn and attack. The monsters will then attack one at atim; you will suffer less damage this way.

(12) I have not found any traps in chests or coffins, but I have had to use 'Unlock' and 'Open' spells on some of them.

(13) While some spells are available only to wizards, others are available to everyone, however they will cost 1Ø experience points as well as the price in gold, and do not always work.

(14) Bartenders are a mine of information, while you are buying drinks. However beware of the tavern wench, you can be seduced and lose all your gold.

(15) There are various forms of transport, with varying capabilities.

(16) Find the Time Machine and go forward in time to the space battle

(a) You must destroy 2Ø Alien space ships.

(b) Ready the reflector shield before launch.

(c) Use the space shuttle for your initial sorties.

(d) Later, the best space ships are those with maximum fuel and minimum shields (if you have quick reflexes).

(e) Have plenty of gold because docking fees for the space station are very costly.

(f) Try and stay close to Earth if possible.

(17) Now go back in time and destroy the gem.

My thanks to Hilton Close for most of the clues. Would all adventurer's please pass on information to keep this column going.

BULK PURCH. SPECIALS FOR MARCH

by Ed Mehrtens, Bulk Purchasing Officer

This month we have two books, one utility program and yet another joy-stick. The books are 'Basic for Business' and 'Basic Programs for Scientists and Engineers', the program is 'MatheMagic' and the joy-stick is 'JS ØØ7'.

'BASIC FOR BUSINESS'

If you want to get better use of your Apple in business, then this book may help you. The concept behind the book was 'to train business professionals to read, write and debug basic →

programs for business applications. The programs examples are all presented for their instructional value and are accompanied by a brief description of the tasks they were meant to perform.

The first few chapters introduce programming techniques (Algorithms, Flow Charts, Control Structures and Program Structure) and the various functions of the Basic Language. In the later chapters more involved techniques such as Multi Dimensional Arrays and program debugging are covered.

This book is a tutorial on business programming rather than a list of programs.

Normally $21.50, yours for $19 save $2.50 .

'BASIC PROGRAMS FOR SCIENTISTS
---------- AND ENGINEERS'

While this book was not written specifically for the Apple, the Author claims it is compatible with the Apple (and the Pet and TRS 80). The basic used is less powerful than the Apple and 'Users are urged to upgrade the programs to the highest possible level', to this end REMS are used liberally in the source programs to indicate where upgrades are desirable.

Some of the areas covered are : Mean and Standard Deviation; Vectors and Matrix Operations; Simultaneous Solutions of Linear Equations; Curve Fitting; Sorting; Least Squares Curve Fitting; Solution of Equations by Newton's Method; Numerical Integration; Non-Linear Curve Fitting; Gaussian Error Function; Gamma and Bessel Functions.

If you are working, or intend working, in Science or Engineering then this book is well worth including in your library.

Normally $25, yours for $22 save $3.

'MATHEMAGIC'

MatheMagic is by International Software Marketing Ltd. and is designed to turn your Apple into a super calculator. This program allows you to enter an equation as it is written in the text book or report (this is called free form). Variable names can be as long as 30 characters and a formula can be up to 227 characters in length. There are 22 inbuilt functions including trigonometric, both common and natural logarithms, anti-logs, and conversions like decimal to hex, hex to decimal, degrees to radians and radians to degrees. Formulae can be stored on disk and can be called by another formula, up to 6 levels are supported. Variables can be varied either in the program or externally as an 'Ask Variable'. There is a single step function in the calculation mode which allows internal calculations to be checked when a formula is first run (always test run any complex calculations) or allows a student to see each step of a problem.

This is the most sophisticated calculator program currently available an if 'Number Crunching' is what you need, then you need MatheMagic.

Normally $120, yours for $108 save $12.

JS 007 JOY-STICKS

These joy-sticks cover the full range and are easy to use, the best thing about them is their price $28. This would have to be the best price I have seen for joy-sticks, yours for $28.

EPSON MX-80F/T Mark 3

I have not had time to do a full test run on this unit as yet, however everything I have checked works just as the book says it should.

Epson MX80F/T MK3 still $1150.

SUMMARY:
---

(1) Basic for Business, $19
(2) Basic Programs for Scientists and Engineers, $22
(3) 'MatheMagic', $108
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APPLECATIONS

Copy is always needed for the magazine.
This can be programs, or useful subroutines, with

suitable documentation. The greatest value is obtained when a technique can be understood by the readers so that it can be further utilised.
Reviews are welcome because they enable other Apple owners to assess the usefulness of a product before buying.
Hardware modifications should be supplied with clear constructional details.

All material is preferred supplied in text file format on a disk, which will be returned after copying.

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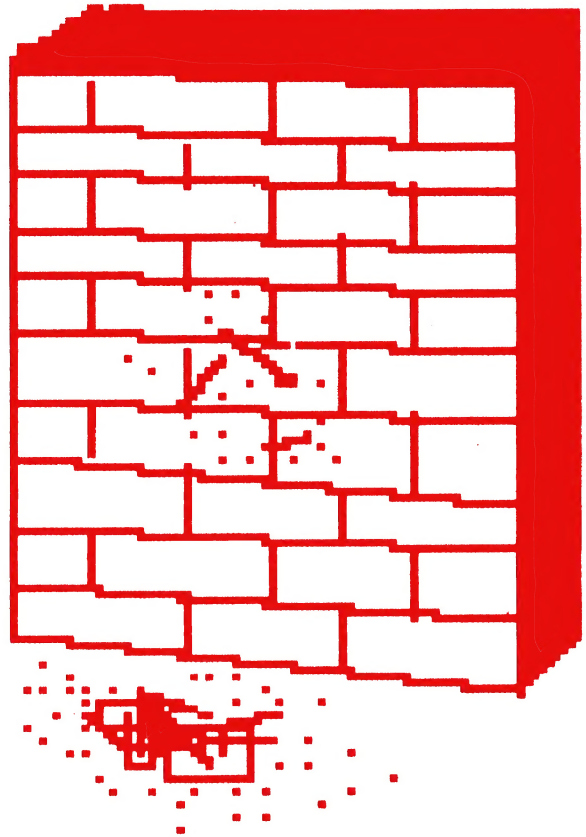

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